



Novel Artefacts to Control Subjectivity, Biases and Mock-Bureaucracy in Knowledge-Intensive or  
ITIL Framework Enterprises and Improving Hevner Design Science Methodology

Submitted in fulfilment of the requirements for the degree of  
Doctor of Philosophy  
in  
Informatics and System Science

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## Declaration

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## Acknowledgements

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I also like to thank my father, who deceased in 2007, for his support and motivation to finish my BSc in Computer science as a foundation stone for the PhD journey. I was young and thought I never needed a degree because my father was financially comfortable; he taught me to respect science. I recall my first project in excel at the university, which was a small database. My father assigned an accountant to teach me the process. My father's encouragement went beyond this and tricked me into encouragement; if I improved my naive system, he would use it at that time.

I have suffered from tremendous oppression and injustice in my life, and it is always worth remembering that your rights and money can always be taken by power. As time passed, I moved to the US, married, and moved again to the UK. Life changed, but knowledge and science were found to be an asset that was more solid than wealth.

My eight-year-old daughter Emma inspired me to continue working and overcoming the difficulties in this work; she is one of the main reasons that helped me continue passing through the obstacles. In fact, she might be the only reason I am continuously working on the project. The aim is to leave her with something she can be proud of when remembering her father.

Finally, thanks to the church community who support me with data collection and information.

## Abstract

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Management bias, a systematic error in human thinking, has broad implications, especially in the employment domain, since some biases could be an unjust decision. These biases potentially divided society into the oppressed and the oppressors, often subconsciously, leading to injustice and both the oppressed and oppressor's disengagement from the system.

Injustice in employment undermines the principle of hiring the best candidate. A Plethora of studies shows that knowledge is reduced within the environment when bias in daily activity and decision-making occurs. As a result, candidate selection focuses not on acquiring and developing new knowledge but on building relationships and networks.

The motivation for this work arises from the amount of literature discussing bias and employment; there is a lack of studies that consider the system or the process as a complete system and then study and mitigate the problem after considering the process from beginning to end, because bias could start informally before the process, but the impact is inside the process.. Indeed several groups rightly claim that they are victims of discrimination because of employment bias, as demonstrated in this thesis.

This study aims to develop a control mechanism, employing a design science research framework to mitigate management biases by developing an explicit management control system in the employment selection process. The new system focuses on knowledge as the central pillar of the design, employing knowledge by an extension, copying system development knowledge from ITIL to an adjacent domain, which is the employment process as input due to hiring to the corporation.

The study employs a design science research framework as a problem-solving paradigm to mitigate the problem after studying the environment from all aspects and then adding rigour to the design.

The study's key findings are that subjectivity in knowledge, subjectivity in the philosophical approach, management behaviours, and biases are the keys that cause the problem. The study managed to remove subjectivity from the knowledge that is subjective in nature and consider it as the main parameter in hiring.

Finally, this system does not aim to theorise or hypothesise but develop an artefact, a prescriptive contribution to world knowledge. This is the nature of the design science research



framework in contrast to the descriptive contribution, where the researcher in descriptive contribution aims to understand phenomena and theorise from these phenomena.

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## Publications

A paper entitled 'Biases Catalogue for Employment' was presented at the 5th World Conference on Qualitative Research (WCQR2021), which was held online (virtual conference) between the 20th and 22nd of January 2021.



## Abbreviations

This thesis avoids abbreviation and any abbreviation identified in the text as soon it is addressed; however, below are the abbreviations used.

AI: Artificial intelligence
CAD system: Computer-Aided Design
CCTA: Central Computer and Telecommunications Agency
COVID: corona,” “VI” for “virus,” and “D” for disease
CV: Curriculum vitae
DSR: Design Science Research
EEOC: The Equal Employment opportunity commission in the USA
GBP: British Pound
ISO/ IEC 20000: International Standard Specifically for IT Service Management
ITIL: The Information Technology Infrastructure Library
LGBT: The lesbian, gay, bisexual, and transgender
NaCoDAE: Navy Conversational Decision Aids Environment.
NHS: UK-based National Health Service
PDCA: Plan Do Check Act Cycle
PLC: Programmable Logic Controllers
PMP: Project Management Professional
PRINCE: PRojects IN Controlled Environments
RACI Matrix: The acronym stands for responsible, accountable, consulted and informed
RAD: Rapid application development
RFID: Radio-Frequency Identification
SECI Cycle: Socialization, Externalization, Combination, and Internalization
STEM: Science, technology, engineering and math.

## Chapter One

### Research Introduction

#### 1.1 Introduction

There are several definitions of bias; Steinbock (1978) described bias as an unequal weighting that favour an idea or thing and is generally unfair or prejudicial. In this research, we adopt the definition defined by Kahneman, an Israeli psychologist and Nobel prize winner, who defined bias as "a systematic error in thinking" (Kahneman, 2011; 2021), either inherent or learned through socialisation.

In chapter one, Section 1.2, the researcher summarises the research domain. In section 1.3, the research focuses on the problem by discussing the chosen domain, followed by an explicit statement concerning the research problem, aims, and objectives in sections 1.4 to 1.6. Finally, in section 1.7, the researcher gives a detailed description concerning the structure of the thesis.

#### 1.2 Research Background

Bias is most commonly studied and assessed by psychologists who apply a range of theories to understand and assess biases. Biases affect all fields of science (see Pietripaoli et al., 2010; FitzGerald and Hurst, 2017), and no one is immune to the impact of biases. There are biases related to culture, favouritism, gender, belief, principle, weight preference, accent preference, et cetera (see Nesdale and Rooney, 1990; Ford and Stangor, 1992; Stangor and McMillan, 1992; Snyder, Tanke, and Berscheid, 1977).

According to human action and reaction theory (Tipper and Bach, 2017; Chartrand and Bargh, 1999; Van Baaren et al., 2004), biases and unfairness have a broader impact on the subject and society with different consequences. The continuous biases damage society and weaken humans who are the country's assets also; this thesis showed that bias impacts performance and cost. This study aims to reduce such impact and propose a meritocracy society by mitigating all subjective arguments from the equation. Although there is a surfeit of studies discussing bias and its effect on people, many studies have examined the impact of discrimination within the scope of employment selection. Still, few studies suggest mitigation solutions supported by methodology to mitigate subjectivity and bias within the hiring and employment selection domain.

Additionally, as Vaishnavi et al. (2004) described, the awareness of the problem came from the researcher discipline; thus, as an ITIL expert certified, the ITIL process and its positive impact on corporations and knowledge are evident; however, there are failures reported in the ITIL framework companies. Through years of general observation employing the author's engineering and computer science background, the preliminary finding is that the corporation's failure due to poor process implementation or modification that could be resolved by rigorously following the ITIL manual. However, the input

impacted the process; the input represented by the hired candidate as a process practitioner, Broadbridge (2004) “it is not what you know, it is whom you know”. Hence, the performance was impacted due to a flawed process due to employment hiring and candidate knowledge. This analogy is a fixed engineering principle that any input affects the process or the output, even if the control component is effectively isolated from the input.

The study rigorously examines the employment selection system, including process, technology, and people, to develop a solution that could be considered a de facto standard that mitigates employment selection issues. This approach helps eliminate process failure due to connection with the process owner or managers. The practical meaning is eliminating bias; for the sake of discussion, let us suppose a manager hires friends; thus, the process could be impacted and unsuitable for use and purpose because of bias or personal exploitation. Therefore, human resources must strategically evaluate the company's needs for employment that satisfy both company and the employee (Cabrera and Cabrera, 2003).

Appropriate mechanisms and designs are developed to mitigate the impact of subjectivity and bias on employment selection. In this research, the researcher rigorously examines the employment selection system (including process, technology, and people) to understand the existence of subjectivity, biases, and management mock bureaucracy in the employment selection process. Moreover, the study aims to systematically develop a solution via the employment of a design science research (DSR) framework, a prescriptive contribution, i.e., a de facto solution, which supports businesses in mitigating employment selection issues.

Design science research states that the outcome, an artefact, should serve as a solution, with the design outcome, both design components and linked theory, contributing knowledge in this business domain. Therefore, this study is not a "descriptive study" that aims to theorise or hypothesise as in traditional research (Hevner and Chatterjee, 2010), but a solution with practical application.

### 1.3 Research Motivation and Scope

The research title outlines the study's argument, guiding the researcher, which informs the reader what the study is about and what direction the study guides the research in this journey. The research title is Novel Artefacts to Control Subjectivity, Biases and Mock-Bureaucracy in Knowledge-Intensive or ITIL Framework Enterprises.

The initial aim is to create novel artefacts in the employment selection for the ITIL framework companies; therefore, the author employs the core method used in ITIL continued service improvement publication that is open/closed loop in the form of the complex loop as monitoring methods that can be fit in an artefact to eliminate biases and mock bureaucracy in the selection process, ensuring the process fits for use and purpose. The reason is that any input impacts the output, and the ITIL control component becomes unsuitable for use and purpose without continuous modification. Thus, the focus is to eliminate biases through developing artefacts employing design science research frameworks and complex loop

monitoring methods to reduce management biases and mock bureaucracy in the employment selection process.

The monitoring methods (open/closed loop) require a control component to monitor the system and intervene to reduce bias; in this study, the system is the employment selection. The control components for the loop require a five-component control system that is 1) the input; 2) the controlled process, which in this study is the hiring process; 3) the output - which in this case relates to the hiring decision; 4) sensing norm – which in this study relates to the bias in employment; 5) the controller to the norm – which in this case is the controller that manages the open- and closed-loop feedback (Argyris, Schön, 1974; Jong, Kolthof and Pieper, 2008).

A feedback mechanism to monitor any event or system impacts the outcome positively Jong & Kolthof, and Pieper, (2008). However, this study concerns "How to create"; therefore, it involves how the study employs an open/closed loop to ensure maximum performance and capability as suggested in the ITIL framework. The complexity lies in employing the monitoring loop to ensure maximum capability and performance. As a result, the study provides satisfactory outcomes to stakeholders by mitigating biases during employment selection.

The satisfactory outcome of employment selection is the input to the corporation that eventually impacts the work process. Drucker (2001) stated that "poor employee performances can cost organisations lost productivity up to organisational closure." Therefore, the organisation's input impacts the corporation's process (Drucker, 2001). The ITIL framework mitigates biases in the work process by employing matrix management methods in the shape of a process owner, process manager, and process practitioners. It is because input affects output that the employment selection has been adopted. After all, it impacts the corporation's process. Thus, the developed system could work with the ITIL framework to reach idealism. Otherwise, the ITIL framework or knowledge-intensive company could have process complications if the hiring system contains bias. Those kinds of companies depend on knowledge as the framework's core, so the company value and knowledge are impacted if the problem accumulates in the system.

The company system is based on individual contributions to the process where if bias in employment existed, that leads to networking, Groupthink phenomena that impact the ITIL process as explained in Ch2 figure 1.1.

Moreover, when the input selection to the corporation is based on characteristic matches and networks, as demonstrated by the Delta Airlines study Yei-Fang Lin (2002), the action voids the matrix management methods because it violates the principle of matrix management as separate independent entities. By contrast, networks are not independent and are affected by the bandwagon effect bias, or what is known as the groupthink phenomenon. Thus, matrix management requires independent entities based

on individual opinions to view the case from all sides, not based on a characteristic match or group hiring; this is a selling advantage for the system.

**The study outcome, which is the system for hiring, will work in harmony with an ITIL framework company, as both employ the same ideology and remove the gap affecting the ITIL framework company.**

The second implication is on the ITIL Framework decentralisation process. ITIL V2 was Centralised; **after seven years**, the V3 revision became decentralised; an improvement has taken after an in-depth study of the corporate domain. Likewise, a feedback mechanism is added to the domain to ensure the process fits for use and purpose. Nevertheless, if the employment selection process is "Input to a corporation" based on characteristic matches and biases, **the input affects the process and the output**. This analogy, again, is a fixed engineering principle. To put it more simply, when hiring people based on characteristic match, for example, obedience to authority, the process inside the corporation becomes reflected by one side view, "The managers", "centralised".

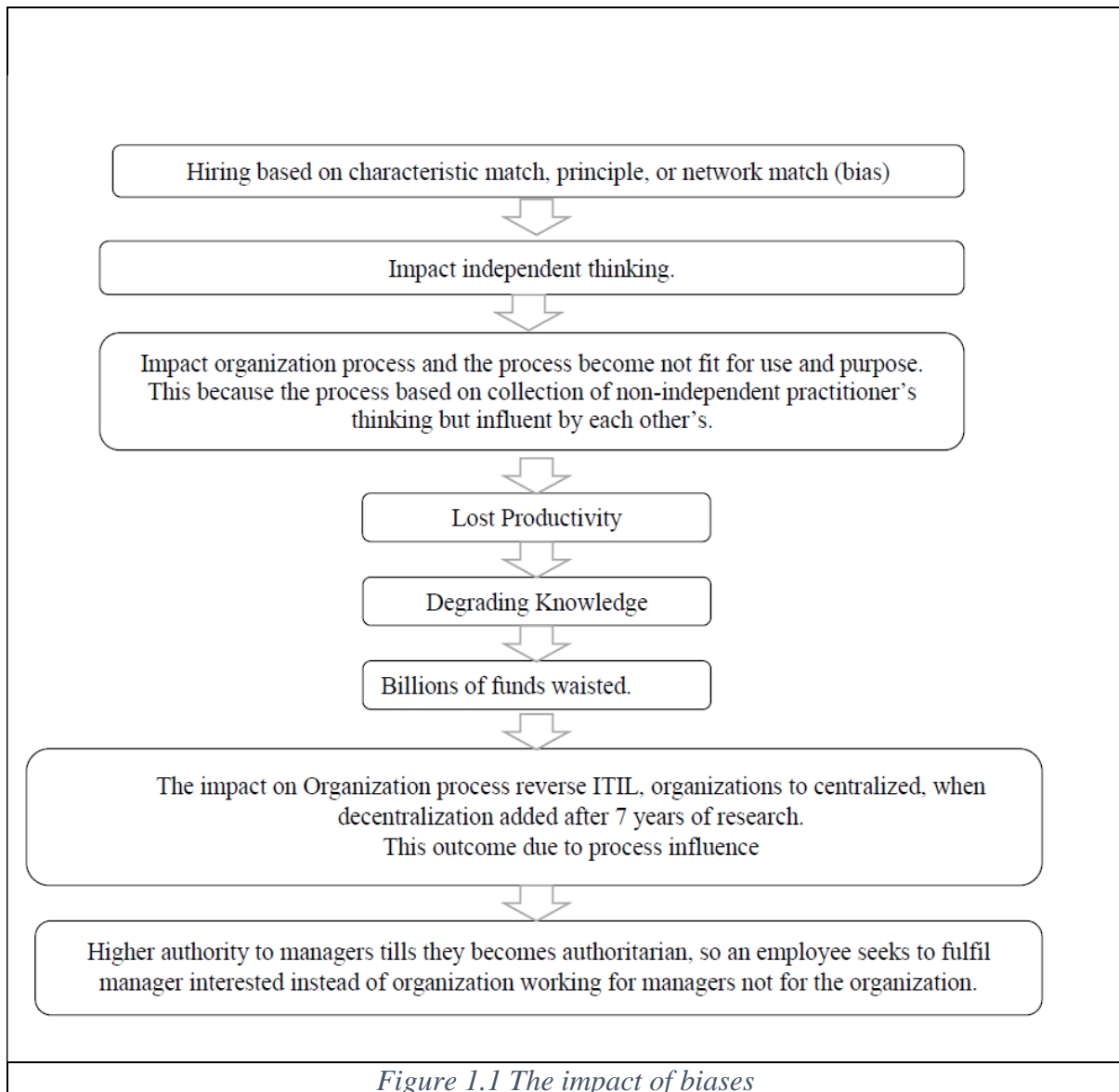
Consequently, a more extensive network chain affects the organisation's process, and the company becomes centralised from the inside due to networking. Therefore process becomes controlled by one manager's perspective same as centralised processes. Whereas decentralisation provides independent assessment combined with matrix management, the decision on action or the process becomes fit for corporation purposes, not management purposes. Accordingly, wrong employment selection puts ITIL back five years if department managers control hiring because it voids independent thinking.

It is worth mentioning that ITIL has much more contribution to the work domain, demonstrated by seven publications. Also, it has a 35% positive impact on a working domain (Marrone, Kolbe, 2010; Marrone, Kolbe, 2011).

The study's objective is to understand the employment selection process issues because each problem demonstrates a gap in the system and requires mitigation. Therefore, a qualitative study was conducted to understand the gaps in the system to tackle and mitigate the gaps in the design science research phase. Additionally, a monitoring system ensures the process is fit for use and purpose.

Thus, the overall research aims to eliminate biases in the hiring system; eventually, billion of funds will be saved from spoilage because the proposed system prioritised knowledge (see figure 1.1.) to demonstrate the impact of bias on the organisation.

Finally, reviewing the literature for employment selection demonstrates that the current employment system has biases and is not fit for use and purpose; besides, it has lots of subjectivity. Therefore, this study developed a new process for employment, considering bias mitigations and then employing the open and closed loop as a monitory system (Wolgast, BaËckstroËm, and BjoËrklund, (2017).



#### 1.4 Chosen Domain and its Relationship with the initial contribution.

The Equal Employment Opportunity Commission in the USA (EEOC) secures over \$500 million (per year) for victims of employment discrimination, handling over 200,000 inquiries concerning potential bias and discrimination, highlighting just how ubiquitous the problem of bias and discrimination is within the modern business culture (EEOC).

Allowing bias to remain unmanaged within a business can significantly impact the recruitment process and negatively impact knowledge and processes productivity inside a corporation. The social inclusion policy, including employment, is one of the UK government's concerns in 2019-2022 (UK Parliament). Biases impact companies and society differently, and much research has been done to understand and remove the impact of biases in business processes. There are lots of algorithms, frameworks, studies and solutions trying to understand and overcome bias issues (see Johnson et al., 1995; Rouse et al.,



2000; Egan, Bendick, and Miller, 2002; Schilt and Wiswall, 2008; Stafford et al., 2018; Rampton, 2020, Sánchez-Monedero, 2020).

The ITIL framework developed by the British government's Central Computer and Telecommunications Agency, which consists of seven publications, has become standard organisation practices. The ITIL employs several methods to eliminate biases and management preferences to enforce specific processes and make sure the process fits for use and purpose without impacting the mentioned process by human tendencies. However, the input could lead to a disruption or failure of the system, irrelevant to how much the process controls the system to isolate lousy input. Hence, multiple wrong inputs eventually disturb or impact the process; therefore, the proposed system considers a continuous ITIL framework as input filtration, so the process continues to be fit for use and purpose.

The employment selection domain includes process, technology and people yet to study collectively as one system correlates with each other and develops a method that mitigates issues that face the system. This is because when processes, people and technology interact, the three parameters develop different biases and impacts.

Accordingly, poor hiring practices in a business will no doubt (given time) result in significant disruption in internal processes and increased failure risk of the system as a whole. Accordingly, endless complications arise if any system fails to control, monitor, and mitigate the bias that is embedded in the system.

A simple literature search using the word 'bias' can return over a million articles, and the use of both 'bias' and 'employment' retrieves over one hundred thousand articles. This quantity of literature highlights the problem's relevance yet highlights the complexity and contextual stickiness of the issues involved, thus, making it hard to assimilate from literature where bias occurs and how it might be controlled. Consequently, it is critical to consider bias within the employment selection domain to develop a methodology that mitigates biases in this system.

## 1.5 Research Problem

Humans are naturally biased, and psychologists have identified over 250 type of biases into a range of categories, for example, memory bias, conscious bias, unconscious bias, statistics bias, logic bias, et cetera (see Edith and Smaal, 2008). Scholars have identified employment bias relating to name, face shape, skin colour, accent, and spelling ability (Derous and Ryan, 2007), yet appreciating how these specific biases impact individuals is challenging. This study considers the implication of bias on employment selection and will consider the conscious and unconscious bias to i) determine whether mitigation is possible and ii) work towards developing a mechanism to expose and remove bias wherever it occurs within employment selection.

Since the goal is to develop a solution that can mitigate management subjectivity and bias, it is essential that the researcher first effectively understands what biases are impacting employment selection and

second, when bias is created and impacting the employment selection process. For example, to allow adequate control mechanisms to be introduced within the employment selection process design to support the removal of subjectivity and bias.

Accordingly, the exact research problem is to understand the domain of employment selection bias, identify when employment selection bias occurs, and develop a feasible solution to support businesses in mitigating bias and subjectivity in the employment selection domain.

## 1.6 Research Aim

The research aims to understand the employment selection process, including technology, people, and procedures, to develop a solution fit for use and purpose to mitigate subjectivity and bias in the employment process. Accordingly, the research needs to:

- a) Understand subjectivity and bias in the employment selection domain and
- b) Develop a solution that employs complex loops represented by open and closed loops to mitigate subjectivity and bias in the employment selection process.

Moreover, due to constant changes in the environment, organisation, and variation in social norms and regulation, the system needs to ensure that

- c) The proposed solution can maintain its relevance over time, i.e., the solution value is likely to perish due to environmental, organisational, and societal change; therefore, continuous system improvement principles should exist.

## 1.7 Research Objective

Ideally, subjectivity and bias will be mitigated from the employment selection process, and the best job seeker should be awarded the position. To achieve the goal, as stated in section 1.5, the researcher needs to:

- i) Understand and evaluates business subjectivity and bias and their impact,
- ii) Develop a solution to mitigate subjectivity and bias in the employment selection domain, and
- iii) Ensure there is a consideration of the perishing nature of the design Science.

It is essential to ensure the consideration of all relevant stakeholders so the researcher does not focus on the views and opinions of just one specific stakeholder type. As such, the researcher must seek to gain data from and consider the experiences of both managers and job seekers.

As such, the research objectives are:

1. Understand and evaluate managers' positions and approaches in the employment selection domain as they are the control component for the open loop.
2. Understand and evaluate the employment process to know when and where the study automated the close loop and the best place to employ the close loop as a monitoring system.

3. Understand and evaluate the bias complication and its impact on employment, society, knowledge, culture, et cetera.
4. Understand and evaluate Jobseeker experience and feedback to achieve system satisfaction and the best location for employing the open/close loop as a feedback mechanism.
5. Understand and evaluate overall issues and biases in the domain to mitigate them by employing design theory.
6. Understand and evaluate the process and technology if they managed stakeholder satisfactions so the study can interact with them successfully in mitigating the issue.
7. Understanding subjective views in the employment system aims to find common ground because the subjective system is hard to control.
8. Find out how other scholars in the domain mitigate biases so it is possible to evaluate their work compared to this study.
9. Develop a system that employs complex loops and incorporates the understanding from objectives 1 to 4 to mitigate subjectivity and bias in the employment selection process.
10. Ensure that the proposed solution can maintain its relevance over time, i.e., the solution value is likely to perish due to environmental, organisational, and societal change by proposing a continuous system improvement method.
12. Evaluate the proposed solution, using feedback from scholars and domain experts, to assess the viability and acceptance of the proposed subjectivity and bias mitigation solution.

## 1.8 Research Contribution

### **Practical Contribution**

The study develops conceptual employment shown in Ch 7 Figure 7.2 as a selection system for a knowledge-intensive company with a public shareholder, including an ITIL framework company. The proposed system could consider a nascent or vanilla design; this terminology is used for default-configured systems.

The nascent design perfectly fits the ITIL framework company, mitigating process failure due to management bias or mock bureaucracy because the hiring selection could impact the process when considering the method of input affecting output.

### **Methodological Contribution**

A modification to Alan Hevner's design science research framework, this modification mitigates the weak point in design science, as shown in Ch7 Figure 7.3, which is the perishable nature of design science. The modification employs the artefact principle on the methodology and synthesis between knowledge developed by intention and knowledge obtained by extension, according to Kaplan (1964).

Many studies have become less valuable due to technological evolution; this could impact practitioner-scholar who employ such studies if there is no mechanism to flag such studies as unsuitable for use and purpose due to technological evolution.

The problem could be driven inversely due to the system evolving; by adding a mechanism to remove this perishable nature, the knowledge spent on first development is harvested and improved to solve the new problem.

### **Theoretical Contributions**

Discover 77 biases that impact the employment selection domain, as shown in Ch 4, Rigour cycles.

Identify the most common denominator in this process and express why, as shown in Ch 5.

Discover a way to remove subjectivity from the knowledge in the employment domain that is subjective by modifying Nonaka and Takeuchi's approach to making it fit in the employment selection domain and removing subjectivity from the domain, as shown in Ch 6.

The study highlights why several scholars could not solve the problem entirely in their articles due to high subjectivity in the domain.

The development of an artefact that represents a system to mitigate bias in the employment domain; considers a prescriptive contribution to knowledge.

## **1.9 Thesis Layout**

This thesis consisted of nine chapters; each chapter has its aim and objective, starting with Chapter two, where the researcher reviewed the implications of bias on society, employment, knowledge, and projects. This work is followed by the researcher reviewing several scholars' works to understand how mitigating bias is possible. Moreover, chapter two discusses how complex loops are critical in mitigating bias.

Chapter three aims to answer the best methods and philosophies to help the researcher achieve the project goal and justify research paradigms. The chapter explains the terminology of the chosen methods to support the reader in appreciating relevant comment language and terms. Also, discuss the position from the data, if qualitative or quantitative later, the chapter explains the chosen methods to have comment language.

Chapter four presents one iteration of the design science methodology, including all three cycles, i.e., the Relevance Cycle, Rigour cycle, and build cycles. Although the artefact provides considerable contributions to knowledge, the outcome of the first iteration failed to develop a complete system, as satisfaction was not obtained; however, the issue that caused failure becomes an input to the second iteration. Still, this iteration outcome identifies 77 biases that impact employment selection and could be used by companies not interested in imposing a new system to highlight bias issues.

Chapter five highlights why developing a system in the first iteration was impossible due to high subjectivity in the domain. Studying these parameters is very important to understand how to tackle them.

Accordingly, this chapter includes the second Relevant design science cycle. The results suggest that managers are not always telling the truth and abuse the power given to them, thus, justifying the need to monitor the process to remove management bias. The outcome of the chapter is a process that was developed after

- i) Interviewing several mid-level managers and
- ii) The author analyzes 18-month data for production incidents and highlights several problematic management behaviours.
- iii) General observation of several processes.

Chapter six reflects the second design science iteration, called the Rigor cycle, which employs kernel theory to remove subjectivity from naturally subjective knowledge.

Chapter seven considers the second iteration design and justifies the new system's development cycle. This chapter uses all the knowledge gained from the chapters to develop the new system. Chapter seven also introduces and justifies a proposed modification to design science, i.e. to remove the perishable nature of design science.

Chapter eight aims to remove the argument between build and justify and evaluation, i.e., by

- i) Critically considering the final artefact against biases identified in the first DSR iteration, and
- ii) Introduce the system to various domain stakeholders (practitioners and academics) and get their opinions on the acceptability and viability of the system.

Chapter Nine concludes the thesis and considers in more detail the main contributions of this work, several limitations that the researcher faced, and future suggestions.

Figure 1.2 shows the storyboard of the study.

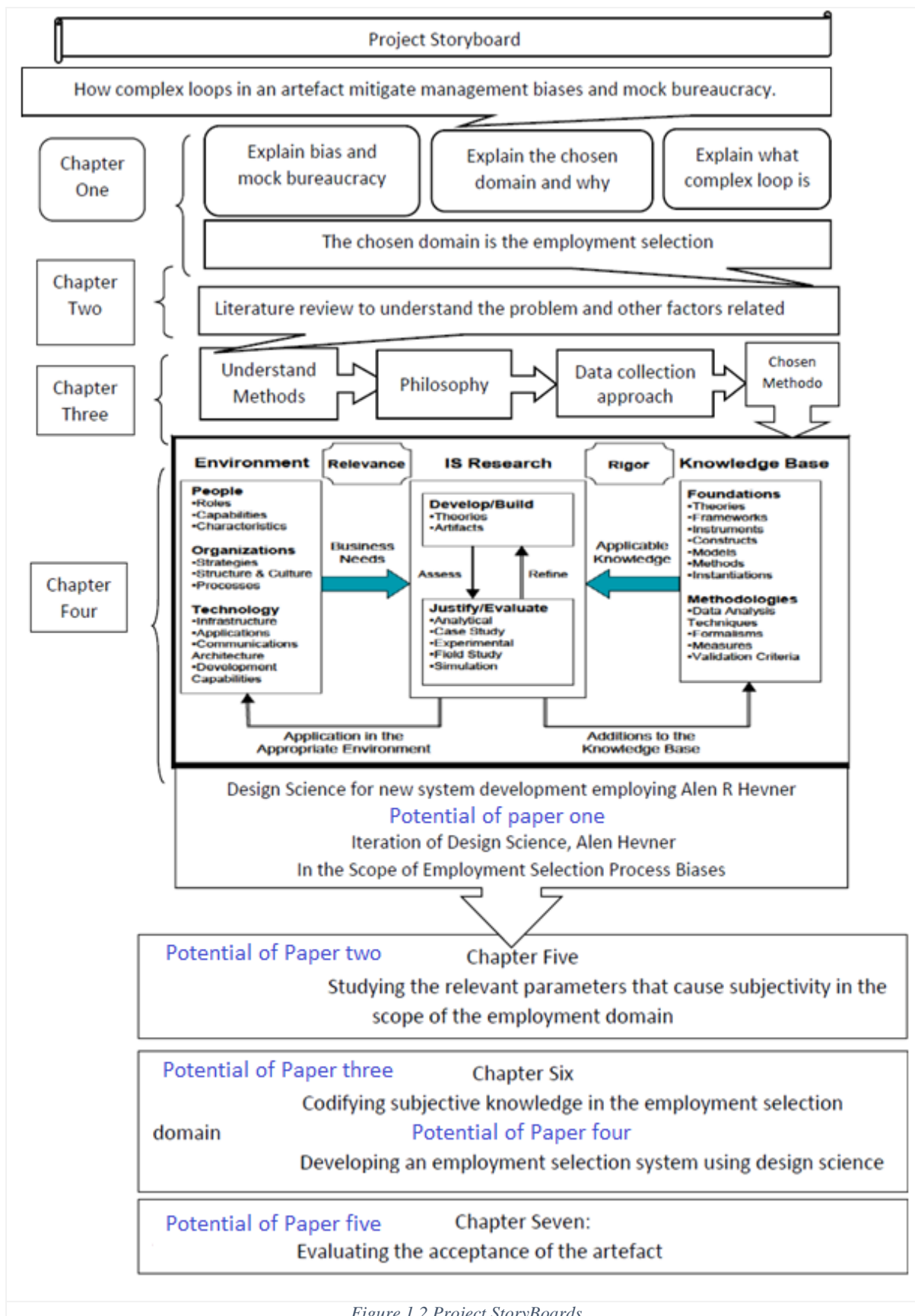


Figure 1.2 Project Storyboards

## 1.10 Chapter Summary

The study aims to develop a system that mitigates bias as a vanilla solution that aligns with knowledge-intensive or ITIL companies. The system's selling point is biased impact corporations and could significantly impact ITIL framework companies; when biased inflame employee toward one view, the company process becomes centralised by one view, whereas decentralisation is added after seven years of the study. Therefore, this system eliminates such issue and keep the system balanced.

Autocratic managers believe the best way to remove disagreement is by having a universal team ideology. If democratic or persuasive management styles impose on such managers, eliminating different views reduces the effort and makes the manager's job easier, turning them into a dictatorship. Therefore, this system prevents dictatorship management from imposing one view by filtering people through hiring.

The study highlighted that bias impacts knowledge, cost, performance and much more besides ethical complications with its reflection on society. The study is pragmatic in nature, aiming for a meritocracy society to lift society as knowledge is the only factor that makes a difference in productive culture.

## Chapter Two

### Literature Review

#### 2.1 Introduction

In his widely acclaimed book 'Thinking Fast and Slow' Daniel Kahneman (2011) described the dual process thinking model, which explains how one part of the mind thinks fast (system 1), and one part of the mind thinks slow (system 2). System 1 (thinking fast) relates to automatic, emotional, and heuristic responses to stimuli. This relates to the subconscious and emotional solutions (i.e., heuristic) to common problems. This automated thinking helps humans automatically process large quantities of information in the world; however, it lacks a means of reasoning. Although system one is fast, it is prone to illogical errors (for example, bias). System two thinking, which only equates to 5% of decision-making, relates to slow, effortful, and logical thinking. System two thinking is less likely to be impacted by biased yet requires much more effort. Since most human responses are based on system-one thinking, illogical and dangerous errors can occur when human activity is left unmanaged.

An increasing number of groups (for example, feminists, LGBT, Black Life Matters movement, et cetera ) rightly argue that they are victims of discrimination due to human biases (Hanks, Solomon, and Weller, 2018; Sundstrom, 1992; Harper and Schneider, 2003). Humans are naturally biased, yet employment recruitment systems commonly fail to control decision-makers prejudice, impacting large parts of society's long-term nature and viability. Therefore, it is vital to identify and remove biases from the employment selection process to ensure that the best knowledgeable person gets the job.

This thesis aims to create a system that mitigates biases in employment selection. It is not the study's goal to theorise or formulate hypotheses as a descriptive contribution but to comprehend the issue to provide a prescriptively implementable solution (Hevner and Chatterjee, 2010)). Therefore, this thesis's focus is not on solving and controlling individual discrimination cases but on developing a broader perspective solution to minimise the impact of bias on business and society. Albert Einstein said, "A clever person solves a problem, but a wise person avoids it". It is the intention that such a mitigation solution can be used within the employment domain to highlight and remove the chance of bias before bias becomes a problem.

According to Jesson et al. (2011), the best literature review is the one that brings together multiple fields of study to develop new knowledge. Accordingly, this study introduces several topics and fields of research relating to complex issues, including knowledge, bias, management, and technology. The focus of this study is to mitigate biases in the employment selection domain, which current studies suggest has a broad impact on society and individuals.



This chapter aims to provide the reader with an adequate understanding of the impact of biases in employment selection, explicitly highlighting the relation between knowledge management and organisational performance (i.e., productivity and cost). This chapter elucidates several factors related to the research problem and is split into the following sections.

In section 2.2, the author i) outlines the implication of biases in general and their impact on society, ii) the significance of biases and their effect on employment selection, and iii) the bias in the current human experiences in hiring; correlated with management's everyday decisions. In section 2.3. the researcher considers the impact of biases in the employment selection domain, with the section demonstrating the link between project failure and bias through performance and outcome. This study argues that knowledge impacts employment selection and, in turn, affects the corporation's knowledge. The study needs to examine the effect of biases in employment selection that impact organisational performance, a critical point that links employment selection to knowledge. In section 2.4, the researcher highlights the importance of knowledge in the problem of bias, and in section 2.5, the researcher considers how employment bias impacts an organisation's performance. In 2.6, the researcher considers research that aims to mitigate subjectivity and bias, followed in section 2.7, a demand to consider the manipulation of control loops. Finally, section 2.8 considers the research motivation and states the thesis goal and objectives.

## 2.2 The Impact of Bias

Bias is defined in this research as being a systematic error in thinking' (Kahneman, 2011). Bias is most commonly studied and assessed by psychologists applying various theories to understand and assess bias. The word bias in the human mind has a broad meaning but undoubtedly impacts human behaviour. There are biases related to culture, favouritism, gender, belief, principle, weight preference, accent preference, et cetera (see Ford and Stangor, 1992; Nesdale and Rooney, 1990; Stangor and McMillan, 1992; Snyder, Tanke, and Berscheid, 1977). Measuring and appreciating biases is complicated, and many scholars discuss this serious issue (see Pietripaoli et al., 2010). Bias affects all fields of science (see Pietripaoli et al., 2010; FitzGerald, Hurst, 2017), and no one is immune from being biased if there is no control mechanism.

Scholars identify several traps that result in bias development. For example, Hammond et al. (1998) identified six keys as bias traps impacting employer decision-making, i.e., anchoring, status quo, sunk cost, confirming evidence, framing, and estimation bias. Anchoring causes decisions to be significantly influenced (positively or negatively) by the initial information received. In employment, domain anchoring prevents applicants' from gaining a fair and objective assessment, as newer information about the applicant is interpreted from the initial reference point. Status quo bias relates to the desire held by the recruiter to keep the situation stable. As such, they will employ someone who is most likely not to impact the current 'status quo, even if this is not the best candidate. Sunk cost bias/fallacy relates to managers' tendency to follow through with an idea if there has already been a considerable investment

of time, effort, and money, even if it has been proved to be without value. As such, an employer may choose to employ someone to support an existing (but failing) solution, i.e., in preference to someone likely to remove or replace solutions where considerable development has already been made. Alternatively, busy managers might decide to employ someone inappropriate for the role instead of readvertising and restarting the employment selection process. Confirming evidence bias exists where the employer seeks out and interprets information in a way that either confirms or supports the values and beliefs they believe to be critical. Framing refers to bias that the decision-maker adopts depending on how the information is presented rather than the information's actual content. If someone presents poor information with confidence, the employer may focus on the candidate's high confidence level (as a positive feature) rather than the absence of meaningful information. Finally, estimation bias relates to the importance of noise in the context of the variable. Some variable variation does not impact the performance outcome, so these variables should not be assessed as bad practice; even minor variations in other variables will significantly impact performance.

When assessing a candidate's specific quality, it is essential that the assessor is aware of critical performance variables and that assessment and variation are effectively and consistently assessed against predefined criteria. The list of human traps is growing more significant to twenty traps (see Lebowitz and Lee, 2015). Bias can be subconscious or conscious in nature.

Interestingly bias (both positive and negative) can be deliberately manipulated or shaped in mind by someone who has a strong awareness of bias types (Kahneman, 2011). Due to the high number of biases, the recruiters must be aware of biases; a decision must be checked to avoid rejecting the most capable candidate in preference of someone whose personal characteristics fit the bias inside the managers.

There are lots of algorithms, frameworks, studies and solutions trying to understand and overcome bias issues (see Johnson et al., 1995; Schilt and Wiswall, 2008; Egan, Bendick, and Miller, 2002; Rouse et al., 2000; Rampton, 2020, Sánchez-Monedero, 2020; Stafford et al., 2018; Rampton, 2020).

For example, Rampton 2020 developed seven steps that i) raise awareness of bias and ii) encourage applying logical 'system two thinking'. This work was extended by Sanchez-Monedero et al. (2020), who automated the process. Johnson et al. (1995) studied the factors in the black community that cause inequality and discovered many factors linked to historical legal policies within the USA. The study suggested that education and investment in the community remove inequality; however, the study did not focus on the selection process itself, i.e., situations where several job rejections had occurred, but instead focused on developing the candidate to face the current employment selection process. Schilt and Wiswall's (2008) studied the pay rate within the transgender society and the change in pay rate after the transition. The study discovered that the pay rate changed dramatically, which is strong evidence of gender equality and evidence bias in gender payment. However, the study did not aim to solve the problem.

Egan, Bendick, and Miller (2002) found that females systematically get less salary than males, even in areas where the compensation should be based on the candidate's ability in the job. Gender inequality is exposed further by Rouse et al. (2000), who stated that providing evidence for sex-based bias in the hiring process is often challenging. However, the study showed that i) bias could fluctuate toward females or males according to the profession, and ii) blind selection demonstrates positive results in bias mitigation; however, the blind selection is not a plausible solution in all situations. Finally, Raghavan et al. (2020) studied how it can mitigate hiring bias using AI software; the studies have generally developed awareness of bias and examined the effect of the solution; however, the study claimed limitations. This is because they could not include issues that a particular model might raise in practice, and the study depends on the vendor; still, they are not sure if the vendor has no biases or mock bureaucracy (for example, Raghavan et al., 2020).

Such algorithm-based solutions, however, raise another part of the problem. Lauren Kirchner, a senior reporting fellow at ProPublica, with Surya Mattu as a contributing researcher, showed that bias is found in the algorithms and data sets that themselves aim to eliminate bias.

For instance, the AI algorithm used by US courts and police to support crime prediction, avoiding human prediction and bias, showed serious bias favouring white males under certain conditions (Angwin et al., 2017). This incident suggests that fixed formalised solutions can consciously or unconsciously incorporate solution developers' bias.

Endless complications arise if systems fail to control, monitor, and mitigate the bias embedded in the system. The same is true in employment; many complications arise when management bias becomes uncontrolled. This study considers the implication of bias on employment selection, aiming to consider conscious and unconscious bias so that mitigation is possible, in contrast to other studies that ignore developing a mechanism to expose bias when bias occurs.

## 2.3 Employment Selection in Human Resources

Human resources have many responsibilities, for example, employee engagement, employment relationship, skill development, employment discipline, employment recruitment and much more; however, this research defines the recruitment process as the primary and essential function in human resources. According to the Sage 2020 HR systems survey, the market leader in twenty-three countries, human resources required a complete transformation, including HR roles and responsibilities. The study reveals that 94% of HR leaders anticipate HR transformation in the next three coming years, with 24% aiming for significant change. The role and responsibility transformation develop new HR roles, like behaviour science and technology, focusing on research and people. So, this study is ideally in line with such change as it focused on people aiming to eliminate bias so the HR process becomes fit for use and purpose. The study demonstrates indirectly and argues that bias and mock bureaucracy in recruitment significantly impact the corporations' process, affecting corporation knowledge and projects inside the

corporation, eventually influencing human behaviour and overall country when considering behavioural theory in the account (Rutherford, 1991 CH7, Hodgson, 2012).

Additionally, the employment interview is an essential source of information and remains, by far, the most frequently used employment selection and decision-making device in organisations (for example, Eder & Harris, 1999; Posthuma et al., 2002). Unfortunately, this reality stands in direct distinction with the continued questions about interview validity and the persistence of biases in the interview process, suggesting that more research in this area is needed (Pingitore et al., 1994; Roehling et al., 1999). Therefore, the next section will address the implications of biases on employment selection

### 2.3.1 The Implication of Bias on Employment Selection Decisions

The US Equal Employment Opportunity Commission (EEOC) secured \$505 million for victims of discrimination in 2018 and more than \$486 million in 2019. The EEOC also handled over 200,000 inquiries concerning potential bias and discrimination claims. If the employment process is done correctly, these funds could positively impact the economy and society (EEOCA database). For example, a simple search of the Scopus database using the word "bias" returns over 1.39 million articles considering bias and over 108 thousand articles discussing biases and employment. This amount of literature in a single database indicates the considerable complexity and contextual stickiness of the issues involved (Hevner, 2004). Additionally, psychologists have categorised bias into several categories, including memory, consciousness, statistics, and logic (see Edith and Smaal, 2008).

The literature highlights several studies that discuss and assess the bias in employment interviews, including accent, skin colour, et cetera. For example, Stroessner and Good (2014) address how stereotypes and employment selection impact decisions. Georgakakis et al. (2018) consider how “Similarity” could positively impact management employment selection, Roy and Christenfield (2007) considered how memory bias could impact employment selection, and Delistraty (2014) showed that a candidate's name could impact hiring bias. Whalen (2020) considered the existence of systemic racism, Hughes and Avoke (2010) considered the areas of poverty and disability biases, Jenkins (2017) considered the bias caused by speaker accent in employment selection, Fikkan et al. (2005) discussed the issue of weight-based biases in employment selection, and Ziegert and Hanges (2005) highlight implicit and explicit racial attitudes when predicting discrimination behaviour in others.

Table 2.1 summarises the discussed article and highlights several scholars discussing and assessing the bias in employment interviews, including accent, skin colour, et cetera.

**The table below is evidence of bias and discrimination in employment selection**

*Table 2.1: The Relationship between SHRM and the organisation*

Article title	Author	Subject discussed
<b>Bias positive impact: Red</b>		<b>Bias negative impact: Yellow</b>
Implicit sources of bias in the employment interview judgments and decisions	Sharon L. Segrest Purkiss a, Pamela L. Perrewé b,Ꝁ, Treena L. Gillespie a, Bronston T. Mayes a, Gerald R. Ferris	The article tackles several implicit biases concerning employment; this article has evidence that undeclared <b>bias could impact the decision outcome.</b>
Stereotype Threat: An Overview excerpts and adaptation from reducing stereotype threat.org	Steve Stroessner and Catherine Good	This article addresses the stereotype issue in employment selection and its <b>impact on the outcome.</b>
Differences that matter: hiring modes and demographic (dis)similarity in executive selection	Dimitrios Georgakakis, Peder Greve & Winfried Ruigrok	This article explicitly stated how <b>Similarity could have a positive impact on management employment selection.</b>
Bias in memory predicts bias in estimation of future task duration	MICHAEL M. ROY NICHOLAS J. S. CHRISTENFELD	Bias in memory that could <b>impact employment.</b>
Algorithmic Bias in Employment	Philippe Bradley-Schmieg, Rachael Cage, Rob Collier-Wright	Algorithmic bias in <b>AI tools downgrades certain people.</b>
The Surprising Way Your Name Affects Your Life	Cody C. Delistraty's	This article shows that a candidate's <b>name could impact hiring bias</b>
New Study Shows That Asking For Salary History Perpetuates Systemic Racism	ANDREW WHALEN	<b>Systemic Racism bias</b>
The Elephant in the Room: Poverty, Disability, and Employment	Selete K. Avoke; Carolyn Hughes	Disability, <b>poverty, disability bias</b>
The elephant in the room: Discriminatory hiring practices in ELT	Sulaiman Jenkins	The accent and speaker bias in employment <b>selection explain management bias.</b>
Weight Bias in Employment	Fikkan, Janna Rothblum, Esther	Bias related <b>to human weight</b>
Employment Discrimination: The Role of Implicit Attitudes, Motivation, and a Climate for Racial Bias.	By Ziegert, Jonathan C., Hanges, Paul J.	The implicit and explicit <b>racial attitudes in predicting discriminatory behaviour.</b>

Managers may, consciously or unconsciously, choose to configure a department by hiring people based on specific biases that serve their best interests, i.e., rather than meeting the need of the organisation. The mock bureaucracy exists when hiring within an organisation is based on matching stereotype bias or matching a particular network to support a manager's interest over and above the corporation's (see Townley, 1994; Gouldner, 1954). The people involved may not be consciously aware of their actions, but corporation guidelines should be implemented to ensure that the most appropriate person for the role is hired.

For the sake of discussion, suppose a candidate demonstrates more knowledge than the manager. In that case, a feeling of dislike or envy is possible, the engendering bias that can impact the decision being made. Similarly, the endowment effect bias, identified by Neuman and Oaxaca (2005), might cause a manager to overvalue some aspect of a candidate within a specific context, which can result in managers rejecting the best candidate because a 'value focus' is not in place. As a result, the company loses the knowledge embedded in this candidate because of management biases. This argument demonstrates that monitoring mechanisms are required to overcome such biases, which is one of the primary purposes of this study. Currently, to the best of our knowledge, few mechanisms exist to monitor this type of manager activity in a decentralised decision-making organisation, which leaves local recruitment open to management bias (Macrae et al., 1998). One positive mechanism is using a points system; however, allocating points still depends on sound judgment and a solid, responsible personality. Although the researcher does not assert that all managers are biased, managers are still people, and people are subject to noise and bias (Kahneman, Sibony, Sustain, 2021). As a result, a management monitoring system is necessary to limit personality or bias.

One bias that is detrimental to knowledge creation in business is the bias that occurs when managers refuse to employ people who are overqualified for the job. It is unclear whether managers are i) intimidated by overqualified individuals, i.e., suspicious of the intention of these individuals; ii) fearful that overqualified individuals may try to influence/manipulate the organisation with their knowledge negatively; iii) whether managers view overqualified individuals as a threat to their management authority; iv) are concerned that such people will expect more pay) whether managers are worried that over talented individuals will not stay in the organisation long-term. Whatever the reason, it is clear that individuals with more qualifications are sometimes viewed with suspicion if they go for a job role that does not align with their peak level of education. In contrast, contracts, processes, and assigned roles and responsibilities could quickly mitigate all the above concerns.

The literature on overqualified fluctuates; some argue it is a negative sign others consider it biased. For example, Stanton (1977), firms should be honest with job seekers about pay because some overqualified candidates may choose to opt out of the screening procedures. According to Fernandez and Weinberg (1997), overqualified applicants are rejected because screeners typically believe they are not committed to extended service. According to Drucker (1954; 1998), companies should not hire overqualified

people because they will eventually quit because they will utilise the company to move into another position with a different company. However, study funding by the European Commission demonstrates several facts. First, one in four workers could be overqualified for their job, and one in three could be underqualified, according to a study finding considering over-qualifications as proxies for competencies. According to the same study meta-analysis, the second finding discovers a considerable difference between nations and sociodemographic categories. This study shows that more than 35% of workers in Sweden are overqualified, compared to only 10% in Finland, with most OECD nations falling somewhere in the middle. The same study shows some data that young people are more likely to be overqualified than older people and that this is also true of foreign workers relative to citizens of the country in question (Quintini 2011). Since research suggests that over 35% of employees in Sweden are overqualified in some circumstances, the word "overqualified" is sometimes used as a shorthand for rejecting candidates. However, other academics argue that overqualified should not be rejected, citing Currie and Kerrin (2003) as examples.

In some cases, overqualified could be pushed out of a job and mocked or considered stupid for accepting low-income; Ignoring life is not fair, and those overqualified have no other option; thus, it should be a mechanism to prevent such an approach. Although concern about candidate character or intention was perhaps more reasonable in the 1970s, i.e., when jobs were more abundant and fewer candidates possessed a higher education, recent improvements in access to academic education mean that many people who have obtained a master's, or even a doctorate degree, find it hard to get a job; and as such seek employment in roles that do not require the level of education that they possess. Such individuals, however, are often viewed with concern. Such biases are strongly criticised in literature (see Vaisey, 2006; Erdogan and Bauer, 2021), as much can arguably be gained. By biasing education, the business is potentially missing out on disseminating knowledge in any team due to the socialisation process (Nonaka, 1991). Accordingly, additional time and cost of expert training can be avoided; since expert individuals are encouraged and supported in the organisation.

Thus, the literature argues that if there is a mitigation consideration of all negative aspects of being overqualified, having an overqualified candidate should theoretically positively affect a corporation through socialisation.

Over 250 biases have been identified and categorised by psychologists as a collection of 105 peer review articles cited in Wikipedia; Kahneman defines bias as a systematic error in thinking. Additionally, Wikipedia lists over 655 social philosophies in 109 articles, matching the similarity perspective of Seong et al. (2015); this might generate too much bias that impacts corporations and humans directly and indirectly. So, if biased left unmanaged, it can lead to or support criminal activity, according to Wang (1997). Therefore, allowing the continuation of bias and stereotypes will ultimately harm the organisation's long-term operation (see Walton et al., 2015). For example, a US survey of women firefighters stated that 85% reported that female firefighters are "treated unfairly" - with many experiencing illegal

bias that included a "sexual component" and others complaining that they "had been subjected to unnecessary danger at work" (Hulett et al., 2008).

In the USA, managers can hire and dismiss employees "at will". Although uncommon, managers can legally dismiss employees for reasons beyond role competence. For example, Suppose the managers feel the employee's haircut is unprofessional. In that case, the at-will law (Muhl, 2001) protects the manager's bias – allowing the manager to reject the employee without even providing a reason for removing employment. Any hired person in such a situation becomes part of the manager's network of influence and becomes bound (directly or indirectly) under the manager's will and preference, irrelevant to whether it is right or wrong, and the decision ignores a potential risk of being left unattended. In the context of safety-critical roles, employees must balance the risk of danger to themselves (and others) against the potential risk of unemployment. Selection and promotion in such organisations are linked to the candidate's ability to fit within the network, and some scholars have correlated management success with golf ability (McGuigan, 2016), which has nothing to do with management ability but everything to do with networking. Similarly, scholars have identified a range of biases that potentially influence employment selection, including name, human face, skin colour, accent, spelling, et cetera (summarised well in Derous and Ryan, 2007).

The undercover recruiter stated that 82% of recruiters confirmed the existence of a "discrimination bias against qualified unemployed" (Larsen, 2022), with 55% of candidates having "personally experienced resistance". This suggests that employers negatively perceive someone, although qualified, as worse if they are currently out of work. Reasons suggest the belief that candidates are most likely "unemployed for a reason" or "probably not qualified". Accordingly, a clear and transparent system is required that does not depend on experience in terms of duration but explicitly calculates requirements in terms of knowledge depth and breadth, i.e., experience and awareness scope.

Since human knowledge is considered part of a company's assets (Rajiv, 2015), company assets will ultimately be affected long-term if you do not employ the most knowledgeable people (Fernandez, Gonzalez and Sabherwal, 2004).

### 2.3.2 Bias in Human Experience Impacted Performance and Decision.

Knowledge codification in the company is rarely perfect enough to substitute human knowledge. Businesses must distinguish knowledge, i.e., the ability to apply information effectively and experience (mainly if the experience is measured in terms of the year). In most companies, experience is considered the key to employment selection; however, managers appear oblivious to experience bias, which can negatively impact selection outcomes. This study does not promote ignoring experience but encourages quantifying expertise in terms of knowledge (i.e., application of information) rather than duration in years.

Experience is contextual and can result in a biased oversight in process and decision-making. An example occurs due to optimistic bias, which occurs when someone believes they are unlikely to



experience a negative outcome. For example, suppose a manager fails to secure the server room because i) they have been there for ten years and no accident or risk has ever existed before, and ii) having the room door open makes access for maintenance easier. If someone gained wrongful access to server data, it would not be surprising if an inquiry asked why this room was not secured. An assumption that everything will be okay since it has always been okay aligns well with optimistic bias (White et al., 2007). Clearly, the manager calculated that the time, cost, and disruption faced by securing the room was contextually high as no risk was perceived. However, in the context of a rare accident happen, the manager suddenly realises that the cost and impact of the disruption are exponentially higher. According to literature (Baker et al., 2001; Campbell et al., 2007; Weinstein et al., 2000), optimistic bias can have either a positive or negative impact on experience, with the impact influenced by the chance of a risk. Ultimately, however, reliance on experience without consideration of experience scope is inappropriate. According to Cartwright and Wooders (2020), who studied experience bias in the labour market, human evaluation of others is impacted by previous experience, for example, hindsight bias and overconfidence. Research shows that humans evaluate others using our expertise (see Christensen-Szalanski and William, 1991; Hoffrage et al., 2000; Dunning et al., 1990), which means there is, in any assessment, a systematic subjective bias because of our own experience. That explains why companies that integrate procedures and processes in the evaluation process are more successful in hiring the best candidate than companies that rely on the perception of candidate experience as the critical decision point.

Cartwright also highlighted literature that demonstrates bias impact on the labour market (see Bertrand and Mullainathan, 2004; Anderson et al., 2006; Mobius and Rosenblat, 2006; Carlsson et al., 2007; Pager et al., 2009; Charness and Kuhn, 2011; Fang and Moro, 2011; Arceo-Gomez and Campos-Vazquez, 2014; Azmat and Petrongolo, 2014).

### 2.3.3 Understand legislation concerning bias and anti-discrimination laws.

There is several evidence and data to suggest that most people have biases, frequently in spite of their conscious views, values, and attitudes. Typically, it is believed that these assessments contain comparisons between social groupings and characteristics or roles like "violent," "lazy or shortcut," "conspiracy," "aggressive," "scientist," and so forth.

The three sections of Prejudice and Philosophy, Moral Responsibility, Structural Injustice, and Ethics, combine the work of several eminent philosophers and psychologists to analyse critical facets of the psychological study of prejudice. The relationship between biases and moral responsibility's core ideas, such as control, awareness, reason-responsiveness, and disagreement, is discussed in several articles shown above and in Moral Responsibility for Bias.". All these factors impact the legislation of biases and anti-discrimination laws. The work in this thesis does not specialise in law, but understanding this aspect helps develop a system that mitigates bias. One of the important law aspects is The Equality Act, which protects citizens from

discrimination by the Equality Act. It means it is now illegal always to discriminate or treat someone unfairly based on their personal qualities, such as age or other protected characteristics.

Those characteristics are age, gender reassignment, being married or in a civil partnership, being pregnant or on maternity leave, disability, race including colour, nationality, ethnic or national origin, religion or belief, sex or sexual orientation (Equality Act 201) (Legislation.gov.uk. 2016. Equality Act 2010). However, a consultation with a law firm advises that people could be discriminated against for those reasons, but the discriminator mentions other reasons to protect themselves, which is a state of mock bureaucracy. For example, a private school lacks adequate disability access and dismisses teachers who suddenly get ill and might need disability access. Logically teacher has to pass PGCE, where one-year teaching and passing interviews and observation, but suddenly the school could claim this teacher is not adequate; the fact is an illness. Thus, in such cases, it is hard for the law or law representative to be 100% satisfied that the claimant or defendant has a valid claim. Therefore, the study in the thesis mitigates such a dilemma or case using the same approach used in cyber security due to uncertainty factors in cyber security.

A Correspondence Act went into force on October first, 2010. The Act provides a legal framework to protect the rights of individuals and advance equality of opportunity for all. It makes a solitary demonstration from in excess of 116 separate bits of regulations (Legislation.gov.uk. 2016. Equality Act 2010). However, the subjectivity and technicality of the implication of the law get lost in the environmental detail that requires subject knowledge experts compared to law representatives that lack such knowledge.

To sum up, biases and specific characteristics are protected by law, and it is illegal, but the practicality and implementation of such cases get lost in court due to the lack of technicality and subjectivity that could interpret each case differently. For example, the victim could not collect evidence if one manager wore a tie with a specific sign and this manager discriminated against the victim. Also, if the second managers wear similar ties, the same message is on the tie, and the manager conducts discrimination action against the victim. The victims know they are linked, but no evidence can be obtained, even if the evidence is indirectly provided. For example, just verbal by indirect phrases that are hard to justify as the victim could also be a liar or have no evidence or the discriminator deny the fact. This explains why the study employs an explicit and open system to mitigate such issues in the employment selection domain.

## 2.4 The Importance of Knowledge Management

This section critically argues that employment selection biases affect corporation knowledge and projects inside corporations, eventually affecting cost. The section highlighted the value of knowledge management and its relation to biases, then how bias could impact knowledge.

Knowledge-intensive companies flourish when outcomes are based on, or related to, the development of new knowledge. Conroy and Soltan (1998) categorised business knowledge as organisation/corporation-based, project management-based, or project-specific-based knowledge. So, suppose employee hiring is based on personality and characteristics matches; in that case, this will negatively impact such companies as no new corporation or project knowledge is being incorporated within the business.

There is no clear correlation between bias in employment selection and corporation knowledge because biased predominantly assessed and studied by psychologists or behaviour scholars; in contrast, knowledge management scholars assess company performance and cost. So, in this section, three -domains are linked, i.e., employment, knowledge management, and psychology. The link between these domains is behavioural management, as several studies assess employment selection and company performance, whereas knowledge management links performance to knowledge and corporation knowledge. Accordingly, the following sections define several important terminologies to understand the problem better (see section 2.4) and then consolidate the case by investigating several failed projects due to errors in thinking, i.e., subjectivity issues and biases (see section 2.5).

Recapping the above point so the link becomes apparent: First, define what an intensive knowledge company is. Second, what is corporation knowledge? Third, the domain responsible for corporation knowledge is Fourth, the subdomain impacted by the biases in employment selection, according to the literature, is knowledge sharing. Fifth, How the bias and experience correlated and, in turn, impacted knowledge. Sixth, bias in the employment selection domain impacts organisational performance; the last positively relates to organisational knowledge. Seven, a study list, demonstrates the positive relationship between organisational performance and knowledge management.

### 2.4.1 What is a knowledge-intensive Company?

The term 'knowledge-intensive company', first coined by Starbucks (1992), relates to companies that develop new knowledge by carrying out research, development, or innovation. Knowledge-intensive companies depend on the creation and use of knowledge, and shareholders appreciate that the value of a share is directly impacted by knowledge acquisition. Knowledge-intensive companies depend on the hiring process, which often depends on experience.

This section argues that bias in employment selection affects knowledge-intensive and quickly negatively impacts such a company if ignored.

The 'Indeed' job website, which describes itself as the number one Jobsite globally (see <https://uk.indeed.com/>), asks applicants how many years they have worked in each role, despite scholars arguing that performance is not measured by time but by the number and variation of tasks completed. So, the number one job website, with over 250 million unique visitors every two months, dismisses the point that experience and knowledge are not explicitly interchangeable.

### 2.4.2 What is Corporation knowledge?

Corporation knowledge is a precious asset for companies, which lies within the processes, procedures, employee tacit and explicit knowledge, configuration items, technology, and more extensive knowledge that can be captured as part of daily activities (Fernandez et al., 2004). Many directors, however, do not consider corporation knowledge to be one of the essential aspects of a business.

Corporation knowledge includes discovering new knowledge through knowledge sharing, exchange, and documentation. As such consideration of corporation, knowledge is a vast domain that studies several aspects of the corporation, such as knowledge management, impact on employee adaptability, process, efficiency, innovation, et cetera (Fernandez et al., 2004). According to Simon (1991), corporation knowledge exists with the people within the organisation, i.e., the staff, and with the stakeholders that staff interact with daily. Therefore, the technology and the knowledge capture system are the heart of corporation knowledge; this includes access management, security and the safety of Intellectual Property (IP), motivation, performance and much more controlled by knowledge management.

### 2.4.3 What is Knowledge Management?

Knowledge management is the critical function and discipline responsible for collecting and managing corporate knowledge. Effective knowledge management ensures that knowledge is captured from humans, procedures, technologies, and resources, when available, to maximise business success (Drucker, 1994).

Knowledge management is a broader discipline that includes knowledge discovery, capture, storage, sharing, and technology to systematically encourage motivated employees and knowledge stewards to harvest and maintain knowledge. Although no company is perfect, and many directors do not consider knowledge an essential domain, most organisations value intellectual property development motivated by knowledge management (Fernandez et al., 2004). According to Chui et al. (2012), effective knowledge management contributes between \$900 billion to \$1.3 trillion in annual value. Chui highlighted that 28% of employee time is spent on information finding and that two-thirds of company profit comes from applying knowledge collaboration and sharing.

Knowledge management covers several subject domains, including epistemology, enterprise architecture, technology alignment, security and database management, process mapping, configuration management, and codification (structured, unstructured, either or both implicit or explicit). The coverage of these other domains is outside the thesis study scope; this study is only interested in particular aspects

that affect employment selection. This chapter argues that the reader needs to appreciate that bias in employment selection impacts knowledge. This process, termed knowledge sharing, will be considered in more detail in the following section.

#### 2.4.4 What is Knowledge Sharing?

Knowledge sharing is the steps required to effectively communicate tacit and explicit knowledge to other individuals or groups, i.e., so that the recipient of knowledge understands it well enough to act on it (Fernandez et al., 2004, P204). Effective knowledge-sharing enhances, trains, and inspires individuals or groups, to continually engage and capture this knowledge through a system that benefits the group (Jensen and Meckline, 1996; Alavi and Leidner, 2001).

Knowledge sharing faces lots of resistance because knowledge is power, and many employees try to retain knowledge to secure their organisational influence and position. Adopting key technology is one factor that eases employee resistance to sharing knowledge; the last is considered an essential intangible asset for the company's sustainability (Fernandez et al., 2004). Therefore, knowledge sharing includes socialisation, technology that eases sharing process, motivation, and a system to exploit and enhance this knowledge as a valuable asset for corporation knowledge. Knowledge Sharing can be fulfilled through a meeting, watching a video, reading documents, undertaking training conversations, attending learning sessions and workshops, et cetera.

According to the above critical literature review, and due to deductive reasoning, the researcher argues that bias in employment selection affects knowledge-sharing through the socialisation phase as a knowledge-sharing process; however, empirical studies are needed to prove this fact.

#### 2.4.5 The Bias in Hiring and its Impact on Organisational Performance.

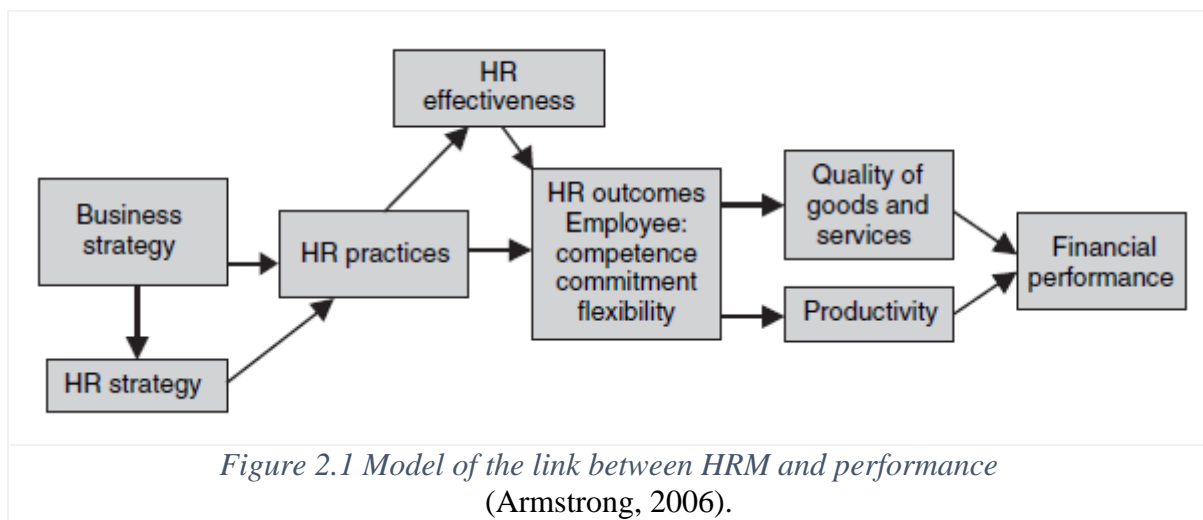
According to Chapin (2009), there is a strong relationship between knowledge and optimistic bias in a study related to health. Chapin's study showed that when knowledge is limited, bias increases; to fill the knowledge gap, Chapin stated that "a little knowledge is a dangerous thing."; a phrase first used by Alexander Pope (1688 - 1744). Accordingly, experience with limited knowledge might be more dangerous than awareness of ignorance if complications arise (Krieger, 1995).

Jashari and Kutliovci (2020) investigated the impact of several aspects of the HR process on organisation performance that is linked to knowledge and found a strong correlation between recruitment and organisation performance, aligning with a plethora of evidence that connects knowledge and organisational knowledge management with organisation performance. For example, Nonaka and Takeuchi, (1995); Birasnav, (2013); Jimenez-Jimenez and Sanz-Valle, (2013).

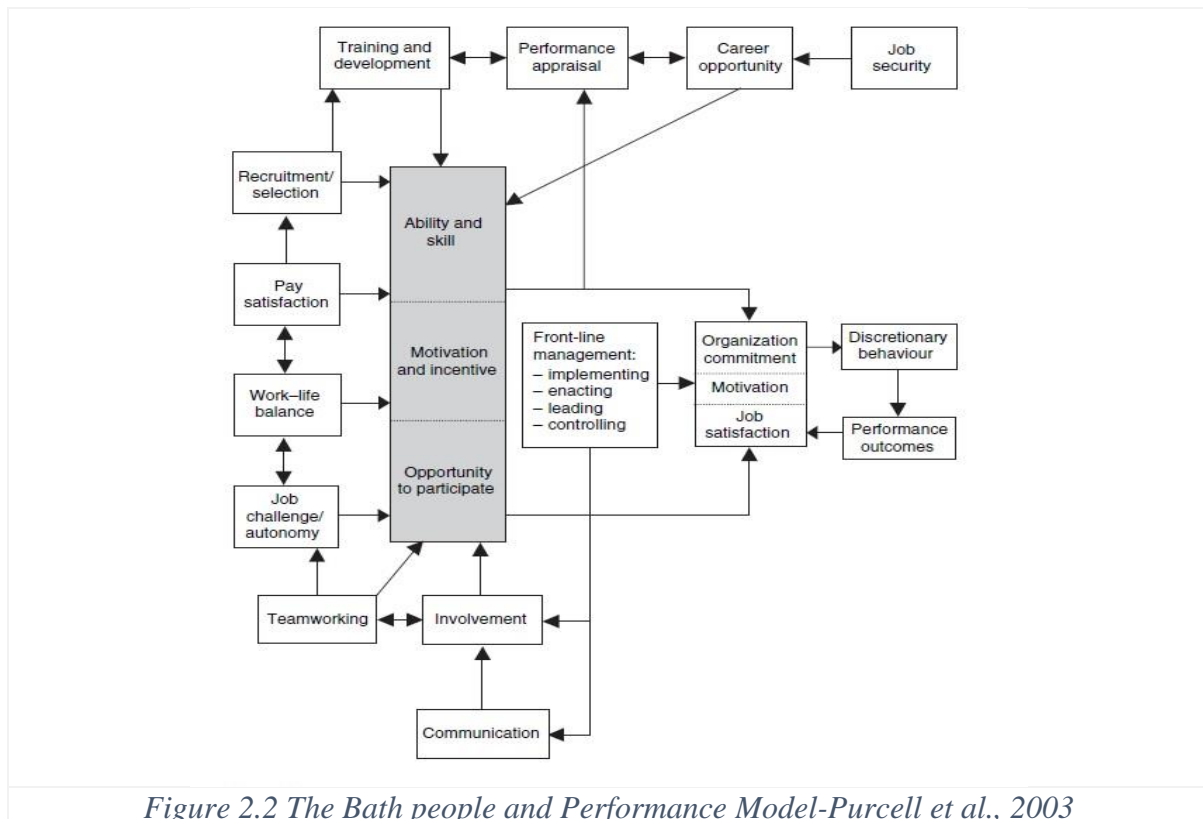
Cankovie and Susnjar (2015), when investigating the operation of over 250 companies, found a high level of corruption in the employment selection processes used. Moreover, there was a strong relationship between employment selection and organisation performance. Conkovie also highlighted that 49.2% of employees admitted that they had been hired due to intervention from inside the company.

The study concluded that a new selection process was needed to i) increase fairness and ii) minimise the impact and risk on company performance and sales profit.

According to Çalışkan (2010), several studies demonstrate the positive influence of HR practices on organisational performance. For example, Guest et al. (2000) surveyed around 800 organisations and interviewed over 1000 professionals (HR and executive). Guest et al. (see figure 2.1) found a link between high productivity and good HR practices. Many complications evolve when a bias is involved in this process, and employment selection is based on principles that contradict each other – for example, team match or forced diversification. Moreover, a plethora of evidence demonstrates the link between knowledge and performance. Guest developed figure 2.1 to illustrate the practice that impacts HR, where the employee is one of the main factors.



Terpstra and Rozell (1993) also found a strong correlation between employment selection and organisational performance; however, they mention that such studies are rare. Additionally, several studies highlight this positive relation, suggesting that indirect evidence demonstrates that employment selection strongly correlates with organisational performance (see figure 2.2). Armstrong addresses this fact in his book and proves the relationship (Armstrong, 2006), which is supported by Purcell et al. (2003).



*Figure 2.2 The Bath people and Performance Model-Purcell et al., 2003*

Several studies linked organisation performance to knowledge management, which is not part of this thesis interest; however, listing them only as evidence shows a positive correlation linking the two factors. For example, Birasnac (2014) linked knowledge management to organisational performance in the service industry, and Seidler-de Alwis and Hartmann (2008) considered how tacit knowledge could be used/managed in innovation companies. Armistead (1999) considered the issue of knowledge management and its role in process performance. Rašula et al. (2012) consider the impact of knowledge management on organisational performance, Gloet and Terziovski (2004) linked knowledge management practice and innovation performance; Syed-Ikhsan and Rowland (2004) looked at the role of knowledge management and knowledge transfer in public organisations; and finally, Meroño and Cerdán (2010) considered the links between strategic knowledge management, innovation, and performance.

Numerous studies have evidenced a considerable link between organisational performance and general knowledge management, including considering both implicit and explicit knowledge. The researcher concludes that hiring impacts organisational performance directly. So, biases in hiring, that is, systematic errors in thinking, will ultimately affect the company's operational performance.

Please see Table 2.2.



*Table 2.2 Reference for linking organisation performance and knowledge management*

Birasnav, M., 2014. Knowledge management and organisational performance in the service industry: The role of transformational leadership beyond the effects of transactional leadership. <i>Journal of business research</i> , 67(8), pp.1622-1629.
Seidler-de Alwis, R. and Hartmann, E., 2008. The use of tacit knowledge within innovative companies: knowledge management in innovative enterprises. <i>Journal of Knowledge Management</i> .
Armistead, C., 1999. Knowledge management and process performance. <i>Journal of Knowledge Management</i> .
Rašula, J., Bosilj Vukšić, V. and Indihar Štemberger, M., 2012. The impact of knowledge management on organisational performance. <i>Economic and business review</i> , 14(2), p.3.
Syed-Ikhsan, S.O.S. and Rowland, F., 2004. Knowledge management in a public organisation: a study on the relationship between organisational elements and the performance of knowledge transfer. <i>Journal of knowledge management</i> .
Gloet, M. and Terziovski, M., 2004. Exploring the relationship between knowledge management practices and innovation performance. <i>Journal of manufacturing technology management</i> .
López-Nicolás, C. and Meroño-Cerdán, Á.L., 2011. Strategic knowledge management, innovation and performance. <i>International journal of information management</i> , 31(6), pp.502-509.

Those studies are enough evidence to link organisational performance and general knowledge management; this includes implicit or explicit knowledge. Since the study aims to develop a solution and agrees with those studies, there is no need to discuss those articles in-depth. The researcher concludes that hiring impacts organisational performance directly. So, **biases in hiring, that is, systematic errors in thinking, affect the company's performance.**

## 2.5 Recruitment bias and its effect on ITIL Framework corporations.

ITIL was developed by the British government's Central Computer and Telecommunications Agency (CCTA) in the 1980s. ITIL, which has had four subsequent versions, was developed and released over time to codify the best practices in information technology (including vendors' best practices). The framework has two paths; the Capability module covers the skills necessary for the planning, defence, and optimising of crucial corporate IT functions with a strong emphasis on security. The second path is the lifecycle model, which is a detailed practice and processes inside the corporation, also ensuring that the process is fit for use and purpose, leading to increased productivity and performance. The framework is also a library for information systems methods used in the framework as a way of codifying corporation knowledge.

The lifecycle framework has several publications, including the Foundation, an IT Service Management. Then, intermedia publications include Service Operation, Service Transition,



Service Design, Service Strategy, and continuous service improvement, which use open and closed loops excessively to control and ensure the process is fit for use and purpose, not influenced by people's agenda. Finally, advance ITIL publication that is Managing Across the Lifecycle.

The detailed system focuses on several mechanisms to ensure the process is fit for use and purpose, like matrix management and complex loop. The process owner, practitioners, and managers control the complex loop as independent entities. However, suppose hiring people is based on a connection. In that case, the independent entities' component is eliminated and becomes weaker, leading to process influence by process owners and not fit for use and purpose.

The second issue is that if the independent component becomes weaker, this leads to process influence by the process owner, and as he becomes the leader of the network, that also could influence strategic management. In such a case, the process becomes centralised by management rather than decentralised, reversing ITIL to version two, where the seven years of research agreed that centralised is a disadvantage and changes it to decentralised.

## 2.6 The Impact of Bias on Project Failure

Knowledge management scholars evaluate knowledge using organisational performance (Lee and Choi, 2003), which involves assessing corporate projects where clear and well-defined delivery, aims, time, budget, and outcome. Although organisational process outcome success will naturally fluctuate in line with market fluctuation, the following section examines project performance as linked to time and budget and illustrates how bias can result in project failure.

For example, the UK-based National Health Service (NHS) developed a computer system upgrade project aiming to give every patient in the UK an electronic patient record, i.e., improve services and patient care nationwide. This programme started in 2002 with a projected cost of seven billion GBP. The plan was to create a record for every NHS patient; however, the programme was abandoned in 2011 when the cost reached 10 billion GBP. The project was represented as one of the worst and most expensive public failures ever (BBC, 2013). In this project, knowledge affordability was not an issue due to the provision of a considerable budget. Instead, human complications, and poor allocation of roles based on a 'whom you know, not what you know' bias, compounded by numerous other factors, contributed to the project's failure. Richard Bacon (MP) stated that "it should be plain to everyone that we are witnessing a systemic failure in the government's ability to provide effective contracts" (House of Commons Committee of Public Accounts, March 2007); a fault that DXC, the company that implemented the project, was awarded the contract as a result of favours. Mr Mark Hasting, who works in the public sector at Rainmaker, told Computer Business Review, "It looks like jobs for the boys. There is very

little sign of genuine effort at disaggregation. They are just moving the pieces around". Even though qualified people were available, a range of biases arguably resulted in nepotism and networked hiring, leading to project failure and a waste of billions of public funds. Margaret Hodge from the Public Accounts Committee described DXC as "rotten", and numerous legal actions had been taken against it, including the world bridge service (same company), which issued millions of visa applications to enter the UK without involving the British authorities. Similarly, a project to provide a dispatch system for NHS Ambulances resulted in 60 people dying unnecessarily due to poor functionality (Beynon-Davies, 1999). As such, the chief officer resigned, and the project was scrapped.

By contrast, similar systems at a much more sophisticated level were deployed successfully. For example, through automation, IBM Operation Management Robot's software will save more than 5,500 companies time and money for over 30 years. The government report, developed by the charter engineering committee, stated that "the attitudes of key LAS members toward the project and the unreasonable restraints they placed on the project allowed the failure to occur". Additionally, when the technology and technical complications were used as a proxy, the British computer society president and vice-president claimed that the "breakdown in the LAS CAD system could have been avoided if computer people had been trained to a professional standard". This explicit statement demonstrates that unqualified staff had been hired to work on the project, even though the budget was more than adequate to employ extensively qualified individuals. According to Liu and Li (2015), 31.1% of IS projects are cancelled before they are completed. Likewise, 52.7% of projects cost more than 189% of their original estimate. By contrast, only 16.2% of software projects were completed on time and within budget. In giant corporations, only 9% of projects come in on time and within budget, with approximately 42% of the original features and functions, raising serious questions and concerns about how IS project success is currently defined and managed.

Complications arise when the input (the hiring process) has no controlled mechanism and the employment selection process fails to fulfil its purpose.

This research argues that a system is needed to support bias mitigation and that hiring should be based on explicit objective role-based criteria. ITIL, for example, aims to control the bias process using matrix management inside the corporation. This research aims to develop a similar controlling mechanism for use in the hiring process, to rectify the identified complications.

## 2.7 Approaches to Mitigating Bias

This section critically analyses studies that have previously aimed to eliminate bias to explain why this research needs to take a different approach.

Edward (2014) used grounded theory to determine how companies could best make the hiring decision. Edward employed a new hiring method, i.e., the repetitive process for ground theory. However, Edward considered intervention for certain unintentional biases; this study employed no mechanisms to avoid conscious biases, such as the Ben-Franklin effect bias, Dunning–Kruger effect, self-serving bias

(Schmitt et al., 2004), or mock bureaucracy (Gouldner, 1954). Since each of these intentional biases could lead to failure, the people involved are likely aware of this violation. In conclusion, the study only considers unconscious bias and ignores conscious biases.

The second study, "Project Implicit", aimed to convert implicit biases into explicit biases to work toward bias elimination. This project was funded in 1998 by Greenwald, Banaji, and Nose. Researchers developed tests to check if a human's outcome is biased; however, this project also focused on unconscious bias, thus ignoring intentional wrongdoing (Project Implicit, Inc. - <https://www.projectimplicit.net/>).

Many studies aim similarly; however, most lack a control mechanism to mitigate bias. For example, in Lieber's (2009) study, researchers provided a checklist as recommendations to mitigate the feeling of bias. One example from the checklist includes 'providing an extra smile on the face of the minority'. This developed checklist, however, was shown not to solve the problem. Likewise, after an in-depth investigation, Delta Air Lines showed no correlation between how well a candidate performed at an interview and how well the candidate performed on the job, which puts the reliability of current hiring processes in question. Delta Airlines discovered that hiring is most commonly related to management characteristic matching biases (Yei-Fang Lin., 2002).

Finally, studies to control employment biases have identified a need for further research (see Brief, 2008; Dipboye and Colella, 2005; Stockdale and Crosby, 2004). None of these studies considered solving the problem using control systems and knowledge management as the key to decision-making. This study contented that all the tools and methods become affordable, in contrast to the damage caused by biases, which makes this study different. In other words, combining knowledge management with engineering and management skills is a rigid system fixing itself when a gap emerges.

In summary, the literature demonstrates that the current mitigation systems are either failing or could fail if management fails to employ independent judgment and knowledge. Moreover, current systems are full of gaps that allow managers to manipulate the system to their advantage consciously. Managers who protect their interests benefit deceitfully. Accordingly, a monitoring system is needed so that the executive responsible for the company can uncover such activity.

Another study worth addressing is Yarger et al. (2019), which discusses algorithm equity in hiring and the impact of AI on the recruiting process. The study's findings summarised that although AI-embedded bias has a significant effect, human expertise is still required. However, humans are naturally biased (Kahneman, 2011); therefore, the only other solution is the approach used in cyber security when humans openly collaborate on removing bias. This approach is used in the thesis to mitigate bias. Yarger et al. (2019) address different studies and concerns that will be solved in the proposed thesis system.

Yarger et al.(2019) addressed several studies negatively discussing AI; for example, O'Neil's (2016) "AI systems are like mirrors reflecting unintentional biases.", Edionwe (2017) Highlighted the data training set and designer bias, Danieli et al. (2016) asserted that hiring decisions is biased in the AI system, Lohr (2015) documented financial lending bias, Angwin et al. (2017) bias in crime and parole decisions and finally Kleinberg and Mullainathan (2019) Highlighted that when equity ignored, algorithmic approaches built on these classic oppressive structures may continue to exacerbate or even magnify existing disadvantages. All this software that aims to mitigate bias could have a bias component. For example, the study highlighted unfairness and bias in different disadvantaged groups like Women, African American, and Latin in the USA, evidence of this fact through different organizations like Facebook and Apple, citing (Huet, 2007; Rayome, 2018a; Lam, 2005; Quillian et al. 2017). Yarger et al. (2019) list several companies, Like Blendoor, GasJumpers, and Interviewing.IO, that employ blind screening to avoid bias, which is a way of hiding identity and other protected characteristics using talent acquisition software. However, the interview stage still exists in the proposed process, in which the literature in this chapter clearly states that the interview has biased components.

In order to construct new systems, societal systems that have existed for a long time and continue to perpetuate inequality must be evaluated. Additionally, the data scientists and computer programmers who create AI systems need to be more diverse; in building and auditing AI systems. Finally, the study discusses different AI biases hidden inside code, Tiku (2018) and numerous instances where sociocultural conceptions of equity and bias in the hiring process interact. The study highlighted the data training set and different factors like data collected from social media to build candidate profiles besides other data sources are not fit and could impair the AI system. This thesis is aware of the AI problem because as soon as the AI is based on open sources, node triangulation of the AI could influence different input sets, and it will be tough to screen and understand the influence.

AI could function better when it is a closed system and data are controlled; therefore, the thesis proposed an idea based on ITIL and cyber security systems, which is an open collaboration system.

A study by Dalal et al. (2020) aims to identify what is called nondiagnostic information on the selection of the candidate in the employment process to mitigate bias in employment selection. Dalal (2020) cemented that the other parameters could impact decision-making. The same approach will be taken in this thesis to identify what are the main parameters that are important to hiring decisions in the employment selection process, Ch4.

Therefore, using AI tools or software without monitoring could be dangerous if bias or mock bureaucracy existed in the process. Software setting, AI setting, the data set, and the parameter set all could impact the outcome and jeopardise the process of a fair outcome; those facts are well known to any computer scientist. The literature shows lots of studies discussing software fairness and AI bias. Thus, those are embedded and hidden, which could not be discovered unless someone has expertise in the

field. Therefore, applying such bias while testing or interviewing a geography expert candidate would be impossible for him to identify those issues. Evidence of software bias was demonstrated by (Zhang et al., 2020; Zhang and Harman, 2021; Aggarwal et al., 2019; Biswas and Rajan, 2021, Chakraborty et al., 2021). Therefore, an open system is the best approach to mitigate bias, which is widely used in cyber security due to high domain uncertainty. The same case as uncertainty could still evolve in technology and AI using data sets or manipulating the setting for intentional bias. However, AI software is still employed in the different stages of the recruitment process, according to Hunkenschroerr and Luetge (2022), although the same study identifies different risks and gaps in the system, for example, Amazon in 2018 where serious gaps spotted discriminated female (Mujtaba & Mahapatra, 2019).

The study by Hunkenschroer and Luetge (2022) reviews 51 articles published since 2016, employing a binary approach; meaning existed or not after-identified search parameters to detect the article, thereby identifying the parameter in the article. This is the same approach used in Chapter 4 to identify articles identifying bias in employment selection.

Hunkenschroer and Luetge's (2022) study identifies different perspectives, including Theoretical, legal, and technical. In addition, identifying AI applications facilitate recruitment selection, such as identifying possible candidates and reviewing shortlisting, identifying the most appropriate candidate, and easing the application process. The bias component and uncertainty existed in all these applications; therefore, the study discusses different mitigation mechanisms; some are classic and not worth addressing. However, one of the non-classic mitigations mechanisms proposed by Hunkenschroerr and Luetge is accountability; nevertheless, if the AI is an open source, accountability fails due to data set and node triangulation that influence the AI outcome. The same case is even in GPT4 or GPT4 Chat, which is an AI with an operating system and complete structural system. Therefore, as any user of GPT4 chats, it is obvious that AI trains to collect data and triangulate from certain sources with certain parameters; if the source changes the data, the AI system is not responsible for the outcome. The second mitigation mechanism is "human oversight", which is the approach used in this thesis when developing the system. This thesis aims to develop the system, and the literature aims to understand the environment. The literature is clear from this perspective that uncertainty exists in AI and even in software settings from different aspects, even the legality aspect Raghavan and Barocas (2020).

To sum up, artificial intelligence (AI) has transformed the recruitment process, improving its effectiveness, efficiency, and objectivity; however, it has several impacts and systematic errors if used solely. AI recruitment is not immune to bias, despite its apparent advantages. In reality, prejudice in AI hiring is becoming more and more of a worry for businesses and organisations globally. The term "AI recruitment bias" describes the ingrained preconceptions and stereotypes found in AI algorithms employed in the hiring process. These prejudices can appear in various ways, depending on gender, race, ethnicity, age, and even educational level. When algorithms employed in recruiting procedures are trained on

biased data, bias in AI recruitment results. For instance, the AI system will reinforce this bias if past hiring trends at a company indicate that men are more likely than women to occupy a specific position.

Similarly, the AI system will favour candidates from certain institutions if a company's past data indicates that those candidates are more likely to succeed in a specific function. The algorithm's biases may be visible if the AI programme team is not diverse, reflecting unconscious bias or prejudice. These unseen prejudiced actions may result in unethical hiring procedures and disqualify eligible applicants from consideration for positions. Therefore, the lack of diversity among those who develop and train the algorithms contributes to AI recruiting bias.

Finally, AI recruitment bias can be avoided in several ways, including:

Diversify the algorithm-development team: The algorithm will not be biased against any group because of this. Regularly audit the algorithm: Any biases that may have been learned can be found, and regular audits of the algorithm can provide opportunities to correct them. Use data that is both varied and representative: Diverse and representative population data should be used to train the algorithm. Make use of multiple data sources: Any biases in one source can be lessened by using multiple data sources. Human intervention is used: AI recruitment bias can be reduced by incorporating human intervention into the recruitment process. For instance, a human spotter can survey the up-and-comers chosen by the calculation to guarantee that no certified competitors have been ignored, which is what this study is planned to do to avoid bias. AI bias in hiring is a growing concern for businesses and organizations worldwide.

One unique study by Frissen et al. (2022) aims to mitigate bias in the employment selection system using an AI system where biased mitigated through word finding and word meaning using natural language processing. However, some bias is based on action and interfered meaning where the decision tree (DT) can not process such meaning. The decision tree is a hierarchical decision support model that uses a tree-like representation of options and their potential outcomes, including utility, resource costs, and chance event outcomes. Also, some bias could be implemented outside of the process but impact the process, as demonstrated in Ch2 and Ch4; therefore, NLP is able to analyse words and their meaning but bias could be action without clear meaning. Thus, lots of bias will not be discovered using such a system because human monitoring is missing. Nevertheless, some approaches suggested by Frissen et al. (2022) will be employed in this study, for example, developing a user interface in which the job description can be reviewed for possible occurrences of bias and discrimination.

P13 According to Frissen et al. (2022), many applications use AI in recruitment, like ResuMtcher, which seeks the best match between a resume and a job posting using language similarity and machine learning models. The second example is Maheshwary and Misra (2018) offer a related piece of work in which the researchers developed a tool to find the best applicant for a job description by employing a deep

Siamese network (Bromley et al. 1993; Chopra et al. 2005). To efficiently capture high-level text semantics, this deep Siamese network is built on neural networks (Adebayo et al. 2017).

Artificial intelligence (AI) and machine learning (ML) capabilities are now included in recruiting software, which helps to streamline and improve the recruitment process. Here are a few examples of the outcome of the Google search engine of how recruitment software makes use of AI:

**Resume screening:** AI-enabled recruitment software can scan and analyse resumes to find pertinent skills, credentials, and experience. In order to match a candidate's qualifications to the job criteria, the AI algorithms may also recognise keywords, employment history, and educational background.

**Candidate Sourcing,** an AI-powered recruiting software, may automatically look for and source people from various channels, such as social media, job boards, and career websites. The programme can use algorithms to weed out candidates who aren't a good fit for the position and concentrate on those who do.

**Interview Scheduling:** AI-powered recruiting software can automatically plan interviews without the need for manual scheduling. The programme can suggest the optimum time slots after checking the availability of both the interviewer and the candidate.

**Candidate Assessment:** Using AI algorithms, assessment test responses from candidates can be analysed to reveal their strengths and flaws. This can aid recruiters in making defensible choices on a candidate's suitability for the position.

**Analytics with Prediction:** AI-enabled recruitment software can analyse historical data to identify trends and anticipate future hiring requirements. The product can likewise utilise prescient investigation to distinguish which up-and-comers will probably acknowledge a proposition and which ones will probably exit the enlistment interaction.

**Predictive Analytics:** AI-enabled recruitment software can analyse historical data to identify trends and anticipate future hiring requirements. The product can likewise utilise prescient investigation to distinguish which up-and-comers will probably acknowledge a proposition and which ones will probably exit the enlistment interaction.

**Diversity and Inclusion (DEI) Products:** Bias in the recruitment process can be identified and eliminated with the assistance of AI algorithms. The software can use data analytics to find bias patterns and offer suggestions for how to deal with them.

**Textio Application:** Textio is an augmented writing platform designed to help businesses improve the quality of recruiting content across job sites, emails, and employer blogs using editing, scoring, and analytics tools.

The listed software can help recruiters save time, reduce costs, and make better hiring decisions. However, non of those applications can guarantee the mitigation of hidden bias and examine bias from the start to the end of the process. Also, non of those applications can be publicly monitored; the algorithms used in the recruitment process should be checked to determine if they are fair, transparent, and free from bias to avoid discrimination against certain groups of candidates.

## 2.8 Understanding The Employed Methods Open and Closed-loop Systems

Open and closed loop systems are driven by system theory proposed in the 1940s by the biologist Ludwig von Bertalanffy (1956). Later Katz and Kahn (1966) first employed an open loop system in an organisation that accepted collaboration in the environment without interfering.

In engineering, the terminology of close loop systems represents a system where a portion of the output is returned, i.e., provided as feedback, into the system (as an input) to support processor output intervention. The use of closed loops reduces errors in the design and improves stability and robustness. By comparison, an open-loop system manipulates or controls the environment according to prior instructions. In social science, the open-loop system is an interaction between subjective and objective, whereas a closed-loop offers no interaction but the determination inside the circle. Luhmann (1995) is a clear example, who created a closed system that allowed data selection from the social environment.

Irrespective of the context, open and closed-loop systems are embedded and used in day-to-day activities and exist in numerous fields of study, such as social science, Sociology, Engineering, Computer, et cetera. Argyris (1976) describes the Complex Monitor Control Loop as an excellent organisational learning tool that increases leadership effectiveness.

In conclusion, the principle of open and closed-loop theories is widely used. This thesis will investigate whether the employment of a complex loop, i.e., multiple combinations of an open and closed loop, referred to as a complex loop, can be used in the employment domain to highlight and remove the existence of biases.

## 2.9 Research Motivation

At this stage, deductive reasoning and evidence clearly show that biases impact society and organisations (Drucker, 2001). Moreover, there is evidence that knowledge promotes the organisation. Furthermore, numerous studies have looked at how to mitigate the issue and provided numerous recommendations. Still, most recommendations support subjective/voluntary correction, which is not helpful if biased behaviour is consciously undertaken. To the best of our knowledge, there is no control mechanism to enforce the recommendation. As such, no current solution can propose a complete system to mitigate the problem, i.e., one that addresses both unconscious and conscious biases.

Scholars view bias from different perspectives, implying that bias can be considered reasonable. The bias is used to enforce either variation or 'good practice', for example, humerus bias, to boost memory information retrieval. This perspective-based view can be considered as aligning with the 'chaos and



order' theory (Smith 1998), which highlights how two people might look at the same object from a different perspective and therefore determine a different outcome. A simple example of the 'chaos and order' theory is the Duck-Rabbit image, which shows how perspective and focus can affect perception and outcome (Ludwig Wittgenstein Fuglesang, 1982); cited by (Smith 1998) - see figure 2.3.

This is the same scenario in employment selection, i.e., where the job seeker may have a very different view of the process from the employer.



Literature suggests that the current hiring system is failing, evidenced by: i) the number of researchers discussing the issue, ii) the fact that the job title and job description sometimes has nothing to do with business need, as described by Rex (2012); and iii) new requirements and methods for hiring emerge every while. Accordingly, this research aims to develop a solution to control the hiring process to stabilise the knowledge system and hopefully bring increased prosperity to the corporation by developing a system that controls and monitors management bias.

This literature review provides strong evidence that biases exist in all areas of human activity, for example, Lin (2002), Lieber (2009), Reinhard et al. (2013), et cetera.

Any prospective employee is a potential part of the corporate asset, and the knowledge possessed by each employee is, therefore, potentially part of the company asset, as the company can use employee knowledge in value creation. If knowledge is not codified and added to the service pipeline and the knowledge management database, the company will be unable to own or benefit from this knowledge (Montana, 2000; Ross et al., 1999).

When developing knowledge by extension and considering the ITIL Framework, the organisation executive depends on three components to ensure the process is fit for use and purpose; however, we need multiple monitoring bodies to ensure the practical application of the process. Accordingly, both open-loop and closed-loop control mechanisms are needed (Argyris 1976).

## 2.10 Conclusion

In conclusion, the literature review is wealthy and highlights the impact of bias on knowledge management, ITIL framework corporation and cost. Also, the literature review discusses different studies to mitigate bias and explains the theory of complex loops and how they could be employed in any system. However, the researcher is yet to discover an article developing

solutions employing a scientific approach considering and utilising i) knowledge management theory, ii) psychological bias, including unspoken bias, iii) management theory, iv) the impact on society, and v) technology. Thus this research aims to develop a solution for the betterment of society using knowledge and unbiased employment selection as a pillar for a prosperous society development that considers inclusion policy in employment selection.

## Chapter Three

### Methodology

#### 3.1 Introduction.

Chapter 2 highlighted the need for a solution to control the hiring process's bias, stabilise the knowledge system, and therefore prosperity and productivity within organisations. Thus, to mitigate the problem gap, the study aims to develop a system that controls and monitors management subjectivity and bias in the employment selection domain.

This chapter examines the best possible ways to solve the research problem by investigating the extensive methodological literature to justify an approach that could help mitigate the research problem. The research methodology and method could help implement this study, which is fulfilled through an intensive review and reflection of the methodological literature. The chapter is written and structured according to the Minto, the Pyramid principle (1991); hence, information is laid on bricks and connected until a complete image is visible to the reader.

Thus, this chapter introduces a range of approaches and methodologies, systematically evaluating their suitability for this study. Consequently, each approach will be considered in light of the research question, goal, and objectives, i.e., to ensure that the best approach is selected to complete the study. Later, after critically justifying the use of methods, the chapter explains the chosen methods' terminology to support the reader with a common grounding of terms and vocabulary.

This chapter aims to answer why the researcher has chosen the selected methods and if it is the right approach. The objective accomplished the aim by first studying the best research approach that could fit the study, so what kind of research satisfied the study's requirement? Second, decide the adopted philosophy in this research because the research paradigm is shaped after merging the research approach with the research philosophy. Third, what kind of data is more beneficial to the nature of this study?

#### 3.2 What is the needed Research Approach?

Several types of research could be employed in this study. Each research type can be categorised based on objective or aim, depth of study, data analysis, time, et cetera. In this section, the author lists several options and critically considers the benefits of such research type in light of the study's aim and objectives.

1. Theoretical or Scientific Applied research is used in STEM fields such as engineering, computer science, and medicine. This type of research aims to develop practical scientific knowledge (Kimmel, 1988; Jesson et al., 2011). Since this study aims to develop a practical framework, applied research could be one of the options.

2. Action research is generally used in social science or education to improve practices by applying action and evaluating this action. In such research, the researcher emerges in the domain of study and collaborates with the users to discover the research problem; an example of such research is Gibson (2005), who "describes a Canadian project" that investigates the social factor concerning Tuberculosis (TB) (Bryman, 2012). So, action research is another option but less beneficial than applied research, i.e., due to the nature of the current study, which aims to develop a system to mitigate bias in the employment domain. The reason is the study's limitation in applying action and examining it in the natural process.

3. Theoretical research, also called basic research, aims to develop knowledge irrespective of the practical element. For example, Edgar (2007) and other studies explore the implication that could be theoretical in a massive system. This research lacks an experimental approach but develops awareness, sometimes called out of touch. According to Edgar et al. (2017), "any research type can run the risk of being irrelevant or out of touch if done incorrectly". So, in the context of our study, theoretical research is considered less beneficial than action research or applied research, i.e., because the study aims to find solutions that can be applied in practice.

4. Exploratory research relies less on theory or literature but is often used as an initial study in less well-understood domains. Since the current study intends to benefit from prior knowledge, an exploratory study, i.e., to elaborate the understanding of theory within the research domain, is not required (Casula et al., 2020). According to Stebbins (2001), exploratory research is inductive in nature.

5. Explanatory research includes descriptive studies, which aim to understand the cause and effect to facilitate generalisation. An example of explanatory research might be the work of Decoteau (2016), who aimed to elaborate on the contribution of the ethnographic study to critical realism. As an explanation of the research domain is not required, explanatory research was eliminated from consideration in the current study because the aim of this study is perspective contributions, which means developing systems to solve real-world problems.

6. Descriptive research aims to understand and define the characteristics of phenomena irrespective of causality. Since appreciation of bias causality is essential to understand how to eliminate bias (Shields, Rangarajan, 2013), the study could consider this approach. However, the goal is a prescriptive contribution, which means to develop outcomes to solve real-world problems, which conflicts with descriptive research; therefore, the study avoids this type of study.

7. Design science research (DSR) is employed mainly in engineering and information systems and aims to develop an outcome-based solution. DSR research involves process, technology, and people, which are the three concern elements in this research (Vaishnavi et al., 2004).

In conclusion, Applied research, Action research, and Design Science Research appear to be possible options. However, design science study looks to match best our goals, objectives, and philosophical approach, which must be aligned to shape the research paradigm.

### 3.3 Research Paradigms and Philosophy

The research paradigm collects beliefs, philosophy, and concepts that shape the research (Kuhn, 1970). The researcher's philosophy and paradigms are vital as they reflect the researcher's beliefs, assumptions, and views when selecting the methods, data collection, approach, and data analysis (Saunders et al., 2003). For example, the positivist paradigm includes objectivist ontology and positivist epistemology. There are many paradigms, i.e., ways to view the world, and these different paradigms are often conflicted, for example, Functionalism, Naturalism, Marxism, Neo-Marxism, Feminist Paradigm, Ethnomethodology, Post foundationalism, Post Structuralism, Existentialism, et cetera. Ontology and Epistemology are the main concepts that shape the research philosophy, and these will be considered in the context of Information systems in the following sections.

#### 3.3.1 Ontology

The word Ontology came from the Greek words "Onto", which means existence or being real, and "Logia", which means science. Since Ontology refers to science, it can be used in non-philosophical content; however, it could also be used in philosophical content. The debate about God's relationship with a human is a philosophical subject that relates to the aspect of God's nature and his role in the existence of human beings. Nevertheless, when considering ontology in science, it is more related to the physical, and the relationship of a physical object to the subject, for example, data structure and hierarchy. Ontology is vital as a philosophical concept as it discusses challenges in creating the theory and the relationship with the theory's parameters, in other words, the reflection of the theory.

Aristotle divided Metaphysics into special metaphysics, for example, cosmology, psychology, natural theology, and general metaphysics (including ontology). For example, materialism ontological discusses the material nature of chemistry, particles, and energy, which we consider to be real compared to abstractions of the human mind. Materialism believes that material exists regardless of human observation (McQueen and McQueen, 2010). Accordingly, the name 'ontology' is sometimes substituted by metaphysics, i.e., the study of being (McQueen and McQueen, 2010).

Ontology in sciences, represented by Sociology, Education, and Business, is essential to understand the domain. According to Saunders et al. (2009), ontology reflects the researcher's view of reality with several positions in an information system, mostly objectivism and subjectivism. However, ontology has four different research philosophies that are sometimes related to business and informatics studies:

i) Pragmatism means external, multiple views to choose the best answer to a research question (for example, Blaikie, 2010; Bryman, 2012; Crotty, 1998).

- ii) Positivism, which means an external, objective view that is independent of social actors.
- iii) Realism, which means if this is objectively real, exists independently of human beliefs.
- iv) Interpretivism means socially constructed, subjective, subject to change, and multiple realities.

The philosophy is linked to changes in the research view because of changes in the researcher's perspective and position. Accordingly, in our research domain, consideration of ontology is vital because it helps the researcher recognise who decides the legitimacy of what is real and how the researcher can consider the conflicting ideas.

The ontology has several beliefs and concepts that consider philosophical debates; the main ones are Singularity, for example, one God or one law, which means one reality. The second multiple reality depends on different factors, and the third accepts both views and reality continuously debated and interpreted. Therefore, the researcher should be clear on the ontological position.

### 3.3.2 Epistemology

Epistemology developed by combining the Greek words "Episteme," which means knowledge, and "ology," which implies doctrine or study. As such, epistemology relates to the study of knowledge, the theory of knowledge, or metaphysics. An example of one of the fundamental questions epistemology attempts to answer is, "what is the nature of knowledge?" Or How is knowledge obtained? Alternatively, "what kind of things exist" If Ontology means reality, epistemology examines this reality.

Aristoteles, influenced by Plato, described humans as being curious concerning the nature of things, i.e., how things apply in context; this explains epistemology as studying knowledge, which is either or both the theoretical or practical application of the information in the context of the researcher's perspective. Epistemology involves knowledge of a fact (called propositional knowledge) like mathematics and practical knowledge or know-how (called non-propositional knowledge) as being crucial.

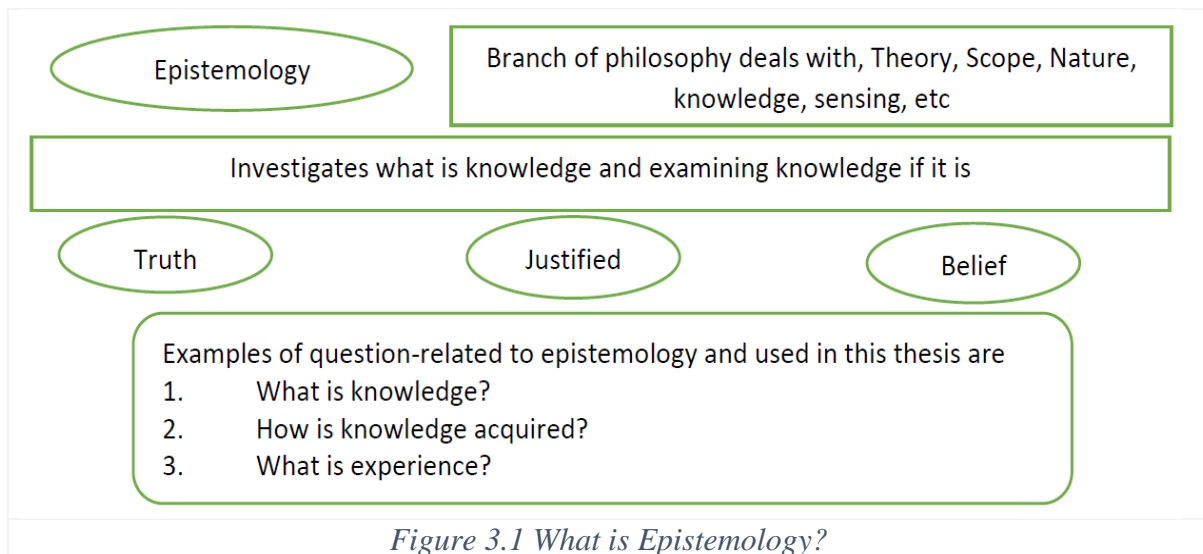
There are three models of epistemology, i.e., i) Dogmatism, which suggests that "we have the true knowledge", ii) Skepticism, which suggests that "we cannot fully trust the knowledge we have, as we do not have a complete picture", and ii) Relativism, which suggests that "we all have different perspectives concerning knowledge importance – and knowledge of context is everything".

Relativism states that it is possible to measure knowledge using reliable tools; however, a complete understanding of reality is most likely hidden and requires interpretation to discover the meaning; alternatively, knowledge should be examined using tools suited to the situation.

The research paradigm is a framework that covers the ways and models of thinking and working within a particular scientific field (Kuhn, 1970).

There are different epistemological positions; for example, Positivism and interpretivism are the most common research paradigm forms when the researcher combines the aforementioned examples from

ontology and epistemology. Figure 3.1 demonstrates the critical issues related to the definition of epistemology.



### 3.3.3 Axiology

Axiology, developed from the Greek words "Axios," meaning worth or value and "Logos", meaning study, relates to the study of value. Sometimes called the study of ethics, Axiology is the branch of philosophy that studies the rightness and wrongness of human action – i.e., considering what is good or deemed as positive Axiology also includes the study of aesthetics, which is a branch of philosophy that deals with the principle of beauty and harmony (Bahm,1993).

Axiology is a critical philosophy and is significant when considering technology use. The term Axiology was first used by Lapie (1902) and popularised by von Hartmann (1908). However, the concepts of axiology date back to Socrates, who believed that knowledge is linked to virtue, morality, and democracy. Furthermore, ethics, which relates to the nature of what is right and wrong, is essential when attempting to address the research question. For example, people might ask, "Why don't I just hire my friend - irrespective of whether they deserve the role or not?". So, considering this is a public company, hiring someone who is unqualified would most likely negatively impact the corporation.

Studying Axiology shows that the definition of what is seen as being correct directly influences knowledge. Furthermore, ethical consideration and approval are needed before attempting research which is axiology practices.

### 3.3.4 Positivism

The French philosopher Auguste Comte is the father of Positivism, which is how researchers view the world scientifically. Positivism believes that only objects or events that can be experienced directly (i.e., validated as existing) should be the focus of a scientific investigation. Accordingly, Positivism cannot deal with questions related to abstract concepts, such as the soul or immortality (Su, 2008).

Positivism looks at society as an overall structure, often employing a quantitative and objective approach rather than individual investigation. In positivism, institutions like education, religion, et cetera influence society. The methods are most likely to support lab experimental instead of fieldwork and used to control or isolate external variables or both (Bryman and Bell, 2007). Positivism allows researchers to study the cause and effect independently from a researcher, which means minimal interaction with research participants. However, Positivism cannot discover the meaning behind the action. Some researchers claim that grounded theory, a qualitative research method, fits under the positivist paradigm (Walsh et al., 2015); however, most researchers describe the ground theory as an interpretivist method (Brown, 1995).

Crowther and Lancaster (2008) argue that a deductive approach is a norm for positivist researchers. However, Orlowski and Baroudi (1991) defined any research that applied formal proposition and quantifiable variable measurement as positivist research. Hence, Positivism scholars look for a relationship or correlation between two variables in the comparative method to ensure a clear correlation exists so the research is repeatable, reliable, and valid.

Scholars argue that a positivist approach has disadvantages in research; since a wide range of concepts, such as time and space, are not based on experience or experiment. Positivism relies on numerical verification as the source of knowledge and validation of knowledge. Positivist business studies are descriptive, which means they unequivocally affirm what takes place but cannot consider subjective and unique arguments and phenomena. As a result, they lack depth and insight into comprehending why problems arise.

The adequate way to end this section is by quoting Hugh-Jones and Laidlaw (2000):

"Positivism is the view that serious scientific inquiry should not search for ultimate causes deriving from some outside source but must confine itself to the study of relations existing between facts which are directly accessible to observation."

### 3.3.5 Interpretivism

Interpretivism is a philosophy that encapsulates the epistemologies, positions, and theories that relate to how humans can gain knowledge from the world, believing that humans socially construct reality and knowledge. Interpretivism refers to theories about how humans can gain knowledge (Gephart, 2018). Djamba (2002) stated that interpretive research aims to understand and interpret the meaning of human behaviour rather than generalise and predict cause and effect.

Max Weber (1864 - 1920) is the founder of interpretivism. Webber suggested that philosophers in the human sciences are primarily concerned with *Verstehen*, which means developing an empathic understanding of human behaviour. However, Wilhelm Dilthey (1833 - 1911) proposed that natural and social reality is different and that their investigation requires different methods, opening the door to developing interpretive methodologies.



Interpretivism is a methodological approach based upon understanding the interpretation and meaning of people given to action, aiming to gain insight into individuals' or groups' experiences. Interpretivism is the opposite approach to Positivism, where the researcher must be independent of the subject. This approach means the researcher understands the subject and often lives the subject's experience (Bryman, 2012). Interpretivism is concerned with Microsociology; this means small-scale sociological analysis that studies people's behaviour and understands detail for further analysis using a mainly quantitative approach. Although interpretivism generally has a higher level of validity than the positivist approach, interpretive study results might be influenced by the researcher's perspective. This causes a challenge in research replication because each researcher might interpret the data differently, which causes some weakness in reliability compared to the positivist approach. Since interpretivistic research looks in-depth at data, the chosen sample usually is considerably smaller than the samples used for the qualitative approach, making it harder to generalise the result to the broader population.

In comparison, interpretivism focuses on analytically revealing the implication of the finding while illustrating how this finding constructs the observable outcome. With all this said, this does not mean qualitative research has no reliability, validity, or generalisability, but its meaning changes based on whether the researcher is observing, identifying, or "measuring" (Bryman, 2012).

LeCompte and Goetz (1982) and Kirk and Miller (1986) independently measured qualitative research external reliability, which means the degree to which a study can be replicated. Both studies suggest that the researcher who is doing replication should take the same position as the first researcher, so the researcher must record the context of data collection as part of the interpretive study. This perspective move is used in ethnographic studies when the researcher emerges in the domain to try and view the world from the participant's perspective. Internal reliability is almost identical to triangulation, which depends on data replication using different methods, data collection approaches, and research. In contrast, internal validity implies whether there is a good match between researchers' observations and the theoretical ideas they develop.

LeCompte and Goetz (1982) suggest using different criteria to measure qualitative research from trustworthiness and authenticity; however, triangulation is a substitute technique. LeCompte and Goetz matched credibility with internal validity, transferability with external validity, dependability to the reliability, and confirmability to objectivity in the quantitative approach.

### 3.3.6 Pragmatism

Pragmatics is a philosophical movement that considers any ideology or proposition true and appropriate if it works satisfactorily. Pragmatic, as a word, relates to dealing with things sensibly and realistically, focusing on practical rather than theoretical considerations. The field of research pragmatics was first founded in the United States in the late nineteenth century. John Dewey, as an educator, is considered by scholars the father of pragmatism because he developed a new way of learning. After Dewey,

pragmatics slowly lost public focus until Charles Morris systematically used the term 'Pragmatics' to establish the branch of semiotics (Morris, 1938). Semiotics is a study of sign processing and interpretation, which is widely used in our day-to-day activities. Morris divided semiotics into three areas:

- i) Syntax, which is the way that deals with the formal relation of signs between two objects;
- ii) Semantics, which symbolises the study of 'the relations of signs to the object to which signs are applicable, and
- iii) Pragmatics is related to the interpretation of signs (Morris, 1938; Levinson, 1983).

Pragmatics focuses on the best way to solve the problem rather than being stuck in philosophical debates, i.e., if the most suitable methods do not fit the philosophical dimension. This phrase means pragmatics are free to use mixed methods and approaches if this is pragmatically required to achieve the research goals. Since pragmatics uses mixed methods and techniques, triangulation methods are a common feature of mixed methods study. Triangulation could be data triangulation, research, methods, or theory triangulation.

Design science is pragmatic, as design science researchers need to understand the hidden meaning behind the design to develop the theory. As such, the effective use of design science depends on pragmatics theory, which accepts that true belief is defined in the context of utility. Thus, pragmatic theories focus on the connection between truth and epistemological practices. Moreover, pragmatics theory supports the pragmatic discovery of complex concerns whilst upholding solid principles of ethics, legal and political, and design (John, 2019).

### 3.4 The Chosen Method

There are two main methods in research, qualitative and quantitative. Each has its benefits; however, since we deal with biases and discrimination that predominantly impact minorities, quantitative is eliminated due to biases and discriminatory action. Still, some argue that the quantitative approach should consider why certain people are more likely to be employed. Those who do not get employed, arguably, do not have a voice to share or influence any unfairness, or both, i.e., allowing the injustice to remain hidden. If the system is unfair, it is reasonable to assume that some very knowledgeable/capable people do not have jobs due to the influence of biases and others with no knowledge or ability at all are consistently looking for work. If we only focus on the employed, then unfairness will remain hidden. Accordingly, there is no way to discover these hidden situations without I) using a qualitative approach and II) involving both employed and non-employed participants.

Moreover, the literature review demonstrates that most approaches seeking to produce new knowledge and discover or understand biases are qualitative. So, the research will consider qualitative data because the study aims to look in-depth at the data to understand prejudice and discrimination to achieve excellent benefits when employing appropriate monitoring controls.

In conclusion, this study believes that capturing qualitative data is the best way to discover hidden meaning, i.e., to be aware that the study aims to develop a system. These hidden meanings help the author develop a solution to mitigate such discriminatory practices.

### 3.5 The Research Framework

According to the discussion in previous sections, and due to the extraction of methodological literature, the researcher believes that applied research, action research, or design science are viable options that should be critically considered in more detail. Applied research is primarily used in psychology to develop new knowledge or systems. Action research requires the researcher to implement actions, observe the outcome, and make relevant interventions, which was not practically possible due to the pandemic. The outcome of this work aims to create a new hiring system that considers people, technology, and processes (the three information system dimensions) as a conceptual system. The development of conceptual systems was first introduced into the literature in 1955 as part of Kelly's "personal construct" theory. Later, several scholars discuss the idea of developing a conceptual system, for example, Bateson (2015), Senge (1990), Luhmann (1975) and Wallis (2016). This new conceptual system will be a prescriptive contribution to knowledge, and as such, the design science methodological approach seemingly matches the study's aim and objectives. Nevertheless, if applied research or action research is deemed necessary, the pragmatic nature of the design science paradigm means that these methods can still be made to fit within the design science research framework (Vaishnavi et al., 2004).

Design science research constitutes the leading research framework to create an artefact to mitigate bias in the employment selection process. Since design science is pragmatic in nature, all appropriate methods, for example, survey or ethnography, could be employed to build the iteration for testing the artefact and understanding the inner-environment and outer environment and the relationship between them (De Leoz and Petter, 2018). The following sections aim to explain in detail how the researcher has justified the use of design science for this research.

#### 3.5.1 Introduction to the Methodological Justification

Richard Buckminster Fuller initiated design science groundwork in 1957 and defined design science as a systematic form of design; later, in 1961 expanded on this concept through a proposal to the International Union of Architects (Hevner and Chatterjee, 2010).

In 1968 Herbert Simon, a Nobel prize winner and an American economist and political scientist, popularised design science in his scientific study, "The Science of the Artificial"; thus, Simon is commonly considered the father of design science. Simon developed an interest in exploring the science of the artefact as a problem-solving paradigm to improve the world's condition. The design is a construct that consists of an idea or concept, a module as a representation of the world, and instantiation, i.e., something physical. Design science research is motivated by solving a field problem rather than filling a knowledge gap. Therefore, the value of the knowledge contribution relates to how well the design

bridges Rigour and Relevance Cycles. Thus, the value of the outcome of design science research, i.e., the artefacts, is based on pragmatic validity. The contribution to the knowledge developed is based on the pragmatic philosophy that the artefact is the contribution of the research, and the findings of the artefact contribute directly to world knowledge.

### 3.5.2 The Artefact

The artefact is the prescriptive outcome of design science, which means an artefact could be a physical object, a system, a procedure, a framework, a model or model(s), a method or method(s), constructs, an instantiation, a theory, a social innovation, a technology, or prescriptive knowledge that is developed after in-depth investigation and research (see Hevner et al., 2004; March and Smith, 1995; Gregor 2009; March and Storey, 2008, Hevner and Chatterjee, 2010). According to Hevner et al. (2004), building and justifying or building and evaluating the artefact is essential, thus allowing the researcher to reflect on how to bridge relevance and rigour for the design in general.

### 3.5.3 Expounding the ideas behind Design Science

Design is a radical breakthrough and requires the "satisficing" of stakeholders. The terminology coined by Simon is a critical concept for "good enough" actions rather than optimal ones (Simon, 1969 P165). The term "satisficing" refers to a method of decision-making in which people only look for potential solutions until they find one they can live with or an acceptable option by the stakeholders. So, satisficing in this project is when the outcome mitigates enough bias that impacts the selection process, and other scholars in the domain accept the outcome to achieve the principle of peer review.

The design proposition is fulfilled through abductive, inductive, and deductive reasoning. However, it is essential to highlight a division between scholars. For example, Järvinen (2007) argues that applied research and design science research are fundamentally similar. In contrast, Livari and Venable (2009) argue otherwise. Applied research was initially a research method in applied psychology (Master, 1995), and DSR was employed in engineering science Simon (1996), which is relatively new compared to its counterpart. Design science research aims to produce something new compared to applied research, which involves developing and implementing intervention and observing how it works and what could happen. Since the humanistic aspect of design science research has the same purpose as applied research and action research (Vaishnavi and Kuechler, 2007; Peffers et al., 2008), researchers seeking to develop an applied research outcome can apply design science. However, unlike applied and action research, design science can stand by itself as a research methodology and framework (Hevner et al., 2004; Hevner, 2007).

Since the current study aims to develop a novel system solution, a design science research framework was deemed the best to pursue. Other methods, such as ethnography, are easily integrated into the design science framework, especially the Hevner framework, as it applies different methods in separate cycles. Furthermore, each cycle could be a complete piece of research by itself, with the outcome of one cycle feeding the other cycles.

Simon stated that design science research has different output expectations to theory testing or interpretative studies, a point of confusion to many researchers who remained unfamiliar with design science research; since design science makes a prescriptive contribution to world knowledge. A few scholars argue that design science can contribute descriptively and prescriptively (Norbert et al., 2012). However, this is still controversial from the design science perspective. Scholars recapitulate that theorisation is a fundamental goal in design science research (Gregor and Jones, 2007). As such, extricating the purpose argument, scholars acknowledge that artefact development can provide a theoretical contribution; yet this typically relates to the theoretical knowledge gained from implementing the artefact. Moreover, several frameworks developed by design science scholars help to theorise from design outcome as the theory and the philosophy embedded in the design (Alturki and Gable, 2004; Venable, 2006).

The existence of iteration in design science allows the researcher to integrate several methods within the framework. Integrated iteration makes design science unique and can be employed in several domains. For example, this study aims to develop a novel solution from the design science framework. A secondary method will be needed, i.e., to identify and understand gaps in the system. For this purpose, an ethnographic study was chosen; because this unique method can be employed to understand (in the context of the current system) the activity that exists (Howitt, 2007; Todd et al., 2004). Hence, design science is not limited by the use of methods, but several methods can be integrated, within separate cycles and iterations, to support artefact development within the framework pragmatically.

The following sections are an exegesis of what the design science framework is, how design science differs from routine design, and what approaches exist in design science; that consequently justify the selection of design science as the best approach to fit this study's aim.

#### 3.5.4 Design Science vs Routine Design

Design categorisation is different according to how the design is conducted; for example, creative design, innovation design, redesign to an existing design, routine design, research design, or design science research. Routine design is problem-solving, employing

knowledge and skills to innovate new artefacts. A possible example of routine design is a programmer programming the solution to a task. The programmer creates something new by applying past methods to develop the new application. However, if software employs a new algorithm or method to solve a problem, this is no longer considered a routine design. According to Tong and Sriram (1992), routine design has several operations, i.e., refinement, constraint processing, patching and optimisation. In contrast, Design science creates new methods after researching the subject domain and contributes prescriptively to world knowledge (Vaishnavi and Kuechler, 2007).

Sir Christopher Frayling developed three research design distinctions, which are "Research into design", "Research through design", and "Research for design". Research into the design reflects the design and designer, the main subject, i.e., academics. For example, scholars focused on specific processes to

design novel artefacts (Frayling, 1994). Lupton (2010) stated that researchers look at the design from outside the discipline in such cases. In contrast, design is research where the knowledge is embedded into the artefact, so ideas, methods, and knowledge are embedded in the artefact, an idea also used as part of design science artefacts. Research through design relates to user experiences during novel artefact development. In such cases, the researcher aims to understand the problem outside of the artefact design and develop the artefact to address the issue or the problem, for example, by employing different artefacts and methods to create a new artefact. Hence, researchers tackle the situation outside the design and use the design to address the problem in such cases; starting with a design in such research is challenging. However, the design is the outcome and contribution of the study.

According to Fryling, "the design should be generating research, not design as research"; however, some academics see this as a controversial argument due to the reduced distinction between research outcome and product design. Hence design science research is a suitable research methodology to support novel artefact creation, which can be evaluated quantitatively or qualitatively to analyse whether the artefact meets the functional and non-functional needs and stakeholder satisfaction.

### 3.5.5 Kernel Theory in Information Systems

Kernel's theory in design science is reflected in the design. It is based on the epistemology of prior knowledge, bearing in mind that the design is a process and product. However, Kernel's theory in the information system domain is a principle that guides the design based on nature and social science. So, the design core is the kernel theory embedded in the design. Nevertheless, Kernel theory in design science is one of the critical activities considered in the design cycle, reviewing past research and past kernel theory (Walls et al., 2004).

Some design theories influence the kernel theory; for example, Gregor (2006) identifies different connected design theories, i.e., theory for analysing, explaining-theory, prediction theory, and design theory like kernel theory. Design theory is also used in action research, i.e., as a starting point by reviewing past design theories and iteratively testing artefacts to move the outcome towards the intended result; design theory can be used as a cycle in design science in general (Hevner 2004: P187). Hence, the kernel theory is embedded in the design, as described by Walls et al. (1992), and demonstrates that the design theory could be a user's requirement to build the system and the principle behind the design. In contrast, Markus et al. (2002) identified the aspect of kernel theory by "requirements, features, and development processes". This approach is the case in the thesis design. Design in an Information system without kernel theory would be questionable if the outcome or the artefact could consider a scientific contribution; in turn, the work becomes unpublishable since the artefact solution is unlikely to be grounded in theory. According to Hevner et al. (2004), testing the Kernel theory has a positive relationship with testing the artefact, which means that testing the theory justifies the artefact. Hevner stated that the rigour of DSR should be derived from the effective use of an existing knowledge base (i.e.,

prior research). Markus (2002) suggested that design could be without theory; however, any practitioner theory could be considered the kernel theory. This suggestion is problematic because the practitioner's theory is most likely not generalised or tested scientifically, systematically and rigorously. Each design must have tested theory embedded in it, or the outcome is routine design only. Hevner and Chatterjee (2010) argue that knowledge management theories like knowledge sharing can be considered kernel theory for knowledge management system solutions which is a more scientific suggestion.

### 3.6 The Selected Approach for Design Science Research

Design Science Research (DSR) is not intended to be a set of prescriptive actions, algorithms, or procedures to fulfil goals (Goldkuhl et al., 2012; Cronholm and Agerfalk, 2001), but a framework that offers a structure to help connect a set of methods or concepts (Jayaratna, 1994). As such, Hevner proposed the following seven DSR steps: Design as an Artifact, Problem Relevance, Design Evaluation, Research Contributions, Research Rigour, Design as a Search Process, and Communication of Research, which are all aline with this study.

The application of DSR has been interpreted differently by a range of researchers, with multiple guidelines and approaches available to support design science research. There are at least fifteen guidelines and approaches where several researchers have adopted DSR ideas, and much literature has attempted to analyse the essential DSR elements and defend their legitimacy for DSR use in various research domains. As such, multiple guidelines and approaches discuss how DSR should be applied; for example, Takeda et al., 1990, demonstrate different variations (see Figure 3.2: Nunamaker Jr et al., 1991; Walls et al., 1992; March and Smith, 1995; Rossi and Sein, 2003; Hevner et al., 2004; Peffers et al., 2007; Kotzé, Van der Mer-we and Gerber 2015; and Pries-Heje et al., 2008a, 2008b). Despite the variations, most approaches follow similar research steps, i.e., problem identification, solution design, and evaluation stages (see Table 3.1).

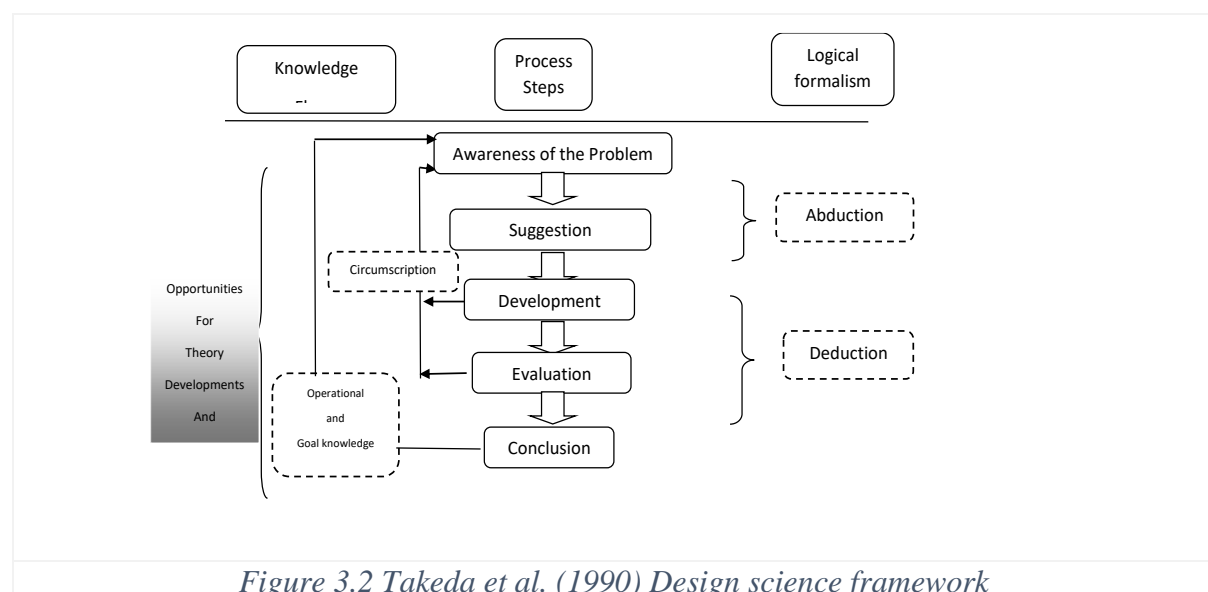


Figure 3.2 Takeda et al. (1990) Design science framework



*Table 3.1 Activity mapping to DSR Framework phases (based on Peffers et al. 2000).*

	Deductive inductive initialisation	Design Principles Induction	Artefact Build	Evaluation
Taketa et al. (1990)	Problem Enumeration Awareness of the problem	n.a.	Development	Evaluation and Conclusion
Nunamaker et al. (1990)	Construct a Conceptual Framework	n.a	Built the (prototype) System	Observe and evaluate the system
Walls et al. (1992)	Meta Requirements Kernel Theories	Design Methods Meta Design	Testable Design	Test Process/Product Hypothesis
Hevner et al. (2004)	Important and Relevant problems	Foundations Constructs Models Methods	Develop /Build	Justify /Evaluate
Peffers et al. (2008)	Problem Identification and motivation	n.a	Demonstration	Evaluation
Sein et al. (2002)	Problem Formulation	Practice-inspired Research	Building intervention	Evaluation formalisation of learning

An example of variation like Pries-Heje et al. (2008) discuss the design from a risk perspective, compared to Venable (2006), who developed four cycles: solution technology, theory building, artefact evaluation, and naturalistic evaluation. However, Takeda et al. (1990) identified five core steps, i.e., Awareness of a problem, Suggestion, Development, Evaluation, and Conclusion,

Variations in the definition of design phases see Figure 3.4, demonstrate the mapping variations in DSR. Despite these variations, however, and based on Kotzé, Van der Merwe, and Gerber (2015), all approaches follow the same core DSR framework phases, i.e., Problem identification, Solution Design, and evaluation (see Figure 3.4). Moreover, steps are performed sequentially as part of a problem-centred approach, in contrast to objective-centred solutions, which start by defining the solution objectives, or a "development-centred approach," which begins with design and development.

See Table 3.2 for the mapping variation across DSR approaches.



*Table 3.2 The Mapping Variation across DSR approaches.*

	<b>Peffers et al., 2008</b>	<b>Takeda et al., 1990</b>	<b>Nunamaker et al., 1991</b>	<b>March and Smith, 1995</b>	<b>Vaishnavi and Keuchler 2004</b>	<b>Hevner et al., 2004</b>
<b>Problem identification</b>	Problem Identification and Motivation. Define the objectives for a solution.	Enumeration of problems.	Construct a conceptual Framework		Awareness of the problem.	Environments. Relevance.
<b>Solution Design</b>	Design and development.	Suggestion. Development.	Develop a System Architecture. Analyse & Design the System. Build the system.	Build	Suggestion. Development.	Knowledge. Rigour.
<b>Evaluation</b>	Demonstration. Evaluation.	Evaluation to confirm the solution. Decision on a solution to be adopted.	1-Observe and Evaluate the System.	Evaluate	Evaluation. Conclusion.	Design -Build -Justify

The contribution to knowledge is based on the pragmatic idea that the artefact remains the main contribution, i.e., a prescriptive contribution to world knowledge. This perspective opposes traditional research, which provides descriptive contributions to world knowledge (Hevner and Chatterjee, 2010). The design proposition is fulfilled through abductive, inductive, and deductive reasoning, so the findings contribute to a real-world problem or context. Moreover, DSR supports the consideration of “satisficing,” i.e., continued development until stakeholders are happy, thus facilitating the humanistic perspective (Vaishnavi and Kuechler, 2004; Peffers et al., 2008).

See below Table 3.3 summarised list of other 15 Variations of DSR collected by the author that is cementing the early statement that there are more than 15 approaches and guidelines in design science.

*Table 3.3 List of additional 15 Variations of the Design Science Approach*

The article Name and Title	Year	Stages						
Takeda, H., Veerkamp, P., Tomiyama, T., Yoshikawa, H.: Modelling Design Processes.	1990	Enumeration of problems	suggestion development	Evaluation to confirm the solution decision on a solution to be adapted.				
Nunamaker, J.F., Chen, M., Purdin, T.D.M.: Systems Development in Information Systems Research.	1991	Construct	Develop	Analysis	Build	Observe and Evaluate the system		
Nunamaker Jr, J.F., Chen, M., Purdin, T.D.M.: Systems development in information systems research.	1991	Construct	Develop	Analysis	Build	Observe and Evaluate the system		
Walls, J.G., Widmeyer, G.R., El Sawy, O.A.: Building an information system design theory for vigilant EIS.	1992	Meta requirements	Meta design	Kernal theory's	Testable design	Design method	Kernel theories	Testable design process hypotheses
March, S.T., Smith, G.F.: Design and natural science research on information technology. Decision Support Systems	1995	Bulid	Evaluate					
Rossi, M., Sein, M.K.: Design research workshop: a proactive research approach.	2003	Discuss proactivity in research						
Hevner, A.R., March, S.T., Park, J., Ram, S.: Design Science in Information Systems Research.	2004	Environments	Relevance	Knowledge	Rigour	Design	Build	Justify
Hevner, A.R., et al.: Design science in information systems research.	2004	Environments	Relevance	Knowledge	Rigour	Design	Build	Justify
Vaishnavi, V., Kuechler, W.: Design research in information systems.	2004	Awareness of the problem	Suggestion development	Evaluation and conclusion				
Aken, J.E.: Management research based on the paradigm of the design sciences: The quest for field-tested and grounded technological rules.	2004	Discuss field testing and rules						
Cole, R., et al.: Being proactive: where action research meets design research.	2005	Action Research and Design						
Venable, J.: A Framework for Design Science Research Activities.	2006	Solution technology invention	Theory building	Artificial evaluation	Naturalistic evaluation			

Peppers, K., Tuunanen, T., Rothenberger, M.A., Chatterjee, S.: A Design Science Research Methodology for Information Systems Research.	2007/8	Define problem	Define objective	Design and development	Demonstration	Evaluation	Communication	
Peppers, K., et al.: A design science research methodology for information systems research. Journal of Management Information Systems	2007	concern information system same 2008 framework						
Gregor, S., Jones, D.: The anatomy of a design theory. Journal of the Association for Information Systems	2007	The purpose why	Constructs	Principle	Artifact mutability	Testable propositions	Justifications	Rule of implementation
Kuechler, B., Vaishnavi, V.K.: On Theory Development in Design Science Research: Anatomy of a Research Project.	2008	Awareness	Suggestion	Development	Evaluation	conclusion		
March, S.T., Storey, V.C.: Design science in the information systems discipline: an introduction to the special issue on design science research.	2008	Discussing special issues in design science						
Pries-Heje, J., Baskerville, R., Venable, J.: Evaluation Risks in Design Science Research: A Framework.	2008	Risk identification	Risk analysis	Risk treatment	Risk monitor			
Pries-Heje, J., Baskerville, R., Venable, J.: Strategies for design science research evaluation.	2008	Strategy only no framework						
Baskerville, R., Pries-Heje, J., Venable, J.: Soft design science methodology.	2009	Identify problem	Problem requirement	Convert problem to general problem	General solution	General design	A declarative search	An instance of the specific solution

To understand the DSR literature, Pascal and Renaud (2020) analyzed 192 articles using four common approaches: i) citation and co-author analysis frequency, ii) co-citation analysis (CCA), iii) bibliographic coupling (BCA), i.e., to understand the usage and contribution scope of each paper and iv) semantic analysis to understand the meaning of the study (Pascal, Renaud 2020, Noma, 1984; Callon, 1993) (see figure 3.3). According to Pascal and Rnaud (2020), an analysis of publications highlighted i) five clusters of DSR research and ii) that Hevner et al. (2004) was the most cited article – see Table

3.4. Cluster one relates to ‘Qualitative Methodological Foundations’, which comprises studies that question and discuss IS theory and the contribution of various applied qualitative methodologies. Cluster 2 relates to ‘Reflections on the IS discipline’, which consists of research that investigates the complex situations that Information System researchers encounter. Cluster 3 relates to Information System Design theory, which suggests that DSR; research is primarily responsible for developing IS design theory. Cluster 4 relates to action research in information system design science and epistemological questions about practically integrating information systems design theory into real-world solutions. Finally, cluster 5, which includes Hevner (2007), relates to the formation of ‘General Guidelines for Information Systems Design Science Research’. This area creates rigorous prescriptive guidelines to structure how information systems should be applied, which links to the aim of this thesis.

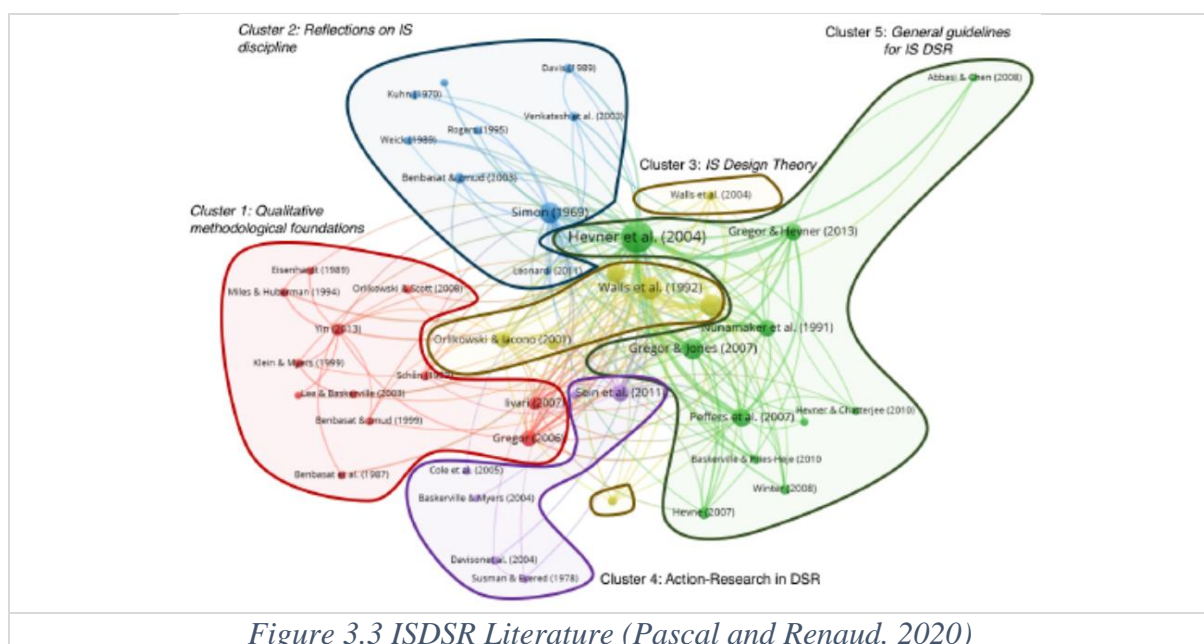


Figure 3.3 ISDSR Literature (Pascal and Renaud, 2020)

Table 3.4 shows the reference, years, numbers of citations, and the percentage in the total number of the article (192), showing Hevner et al. is 74% of 192 articles cited by Hevner in ISDSR. The table is a more explicit representation of the colour cluster diagram.

Table 3.4 Information System DSR core references  
(Adapted from Pascal and Renaud, 2020)

Cluster	Reference	Year	#cit	%	Type
1	Benbasat & Zmud	1999	10	5%	GENIS
1	Benbasat et al.	1987	10	5%	METH
1	Eisenhardt	1989	13	7%	METH
1	Gregor	2006	40	21%	ISDSR
1	Iivari	2007	25	13%	ISDSR
1	Klein & Myers	1999	14	7%	METH
1	Lee & Baskerville	2003	12	6%	METH

1	Miles & Huberman	1994	12	6%	METH
1	Orlikowski & Barodi	1991	10	5%	GENIS
1	Orlikowski & Scott	2008	10	5%	GENIS
1	Schön	1983	12	6%	METH
1	Yin	2013	27	14%	METH
2	Benbasat & Zmud	2003	16	8%	GENIS
2	Checkland	1981	10	5%	GENIS
2	Davis	1989	13	7%	GENIS
2	Kuhn	1970	10	5%	METH
2	Leonardi	2011	11	6%	GENIS
2	Rogers	1995	13	7%	GENIS
2	Simon	1969	64	33%	ISDSR
2	Venkatesh et al	2003	14	7%	GENIS
2	Weick	1989	11	6%	GENIS
3	March & Smith	1995	63	33%	ISDSR
3	Markus et al.	2002	46	24%	ISDSR
3	Orlikowski & Iacono	2001	35	18%	GENIS
3	Vaishnavi & Kuechler	2004	11	6%	ISDSR
3	Van Aken	2004	16	8%	ORGDSR
3	Walls et al.	1992	72	38%	ISDSR
3	Walls et al.	2004	14	7%	ISDSR
4	Baskerville & Myers	2004	11	6%	METH
4	Cole et al.	2005	10	5%	ISDSR
4	Davison et al.	2004	11	6%	METH
4	Goldkuhl	2012	10	5%	ISDSR
4	Sein et al.	2011	38	20%	ISDSR
4	Susman & Evered	1978	11	6%	METH
5	Abbasi & Chen	2008	10	5%	ISDSR
5	Baskerville & PriesHeje	2010	14	7%	ISDSR
5	Gregor & Hevner	2013	43	22%	ISDSR
5	Gregor & Jones	2007	59	31%	ISDSR
5	Hevner	2007	20	10%	ISDSR
5	Hevner & Chatterjee	2010	10	5%	ISDSR
5	Hevner et al.	2004	140	73%	ISDSR
5	Kuechler & Vaishnavi	2012	10	5%	ISDSR
5	Nunamaker et al.	1991	37	19%	ISDSR

Different forms of design science knowledge that scholars widely employ in such research are: first, object design, which is the artefact's design; second, realisation design, which is a detailed process for the implementation of the artefacts; third, process design is a professional plan for problem elimination or developing a solution. All studies, however, used the same principle, steps: i) to build awareness of the problem, which could be demonstrated by a proposal and a suggestion represented through a tentative design; ii) the artefact development and evaluation, which happens via the use of qualitative or quantitative data collection and performance measures; and iii) demonstration of the conclusion during the presentation of the results.

When theorising from design science, three common approaches are employed: first, a deductive approach is completed, which involves developing enlightenment from a given case in an existing body of knowledge; second, an inductive approach is completed, which involves inferring an abstract

conclusion from a specific case; and third, an abductive approach is completed, which explains phenomena from specific consequences.

### 3.7 Hevner's Design Science Framework

This research will adopt the Hevner framework because multiple methods can be more easily integrated with the Hevner framework. The Hevner framework consists of three cycles (Relevance, Rigor, and design cycle). The design cycle (either Develop and Justify or Build and Evaluate) – see Figure 3.4.

The three main objectives of design science are: first, to support the study and understand the former process to mitigate the problem and identify the requirement – known as the Relevance Cycle; second, to build upon prior literature, knowledge, and experience of design science in the information system, which is called the Rigor cycle; and third, to provide research outputs.

The two stages are Environment and Knowledge Base. The environment is used to identify the parameters that impact the design; in current research, the parameters related to the people, technology and process that fit within the organisation. The environment stage is often tackled by undertaking the literature review as the first stage. The knowledge-based stage is used to identify studies, techniques, or past theories to support the design process or both (see Figure 3.4).

Hevner listed multiple essential criteria required as part of the evaluation of a design science research project. The first criterion relates to the precise definition of the research question, commonly used to map design requirements in design science; this criterion is usually addressed in the Relevance Cycle. The second criterion states that the study should explain the artefact, and the research should demonstrate the artefact; this criterion is fulfilled in the build and evaluates cycle. The third criterion explains the design processes and their use in building the artefact. Meeting this criterion also occurs in the build and evaluate cycle.

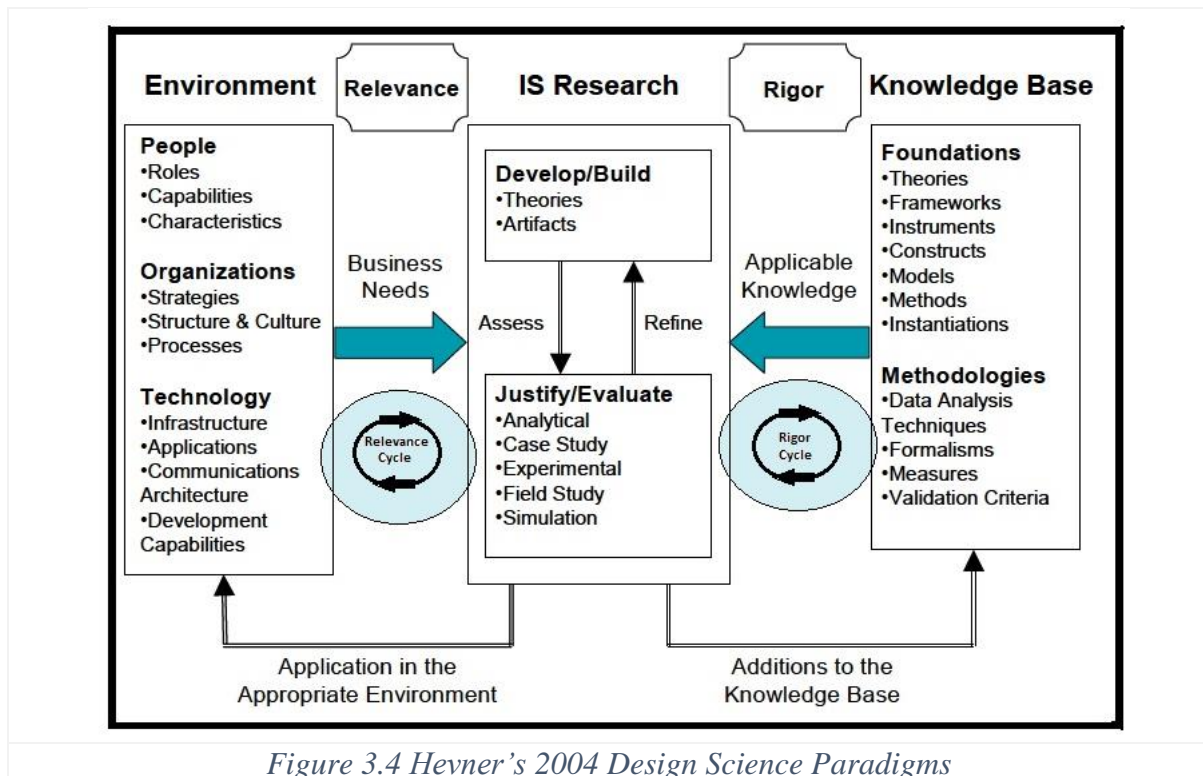


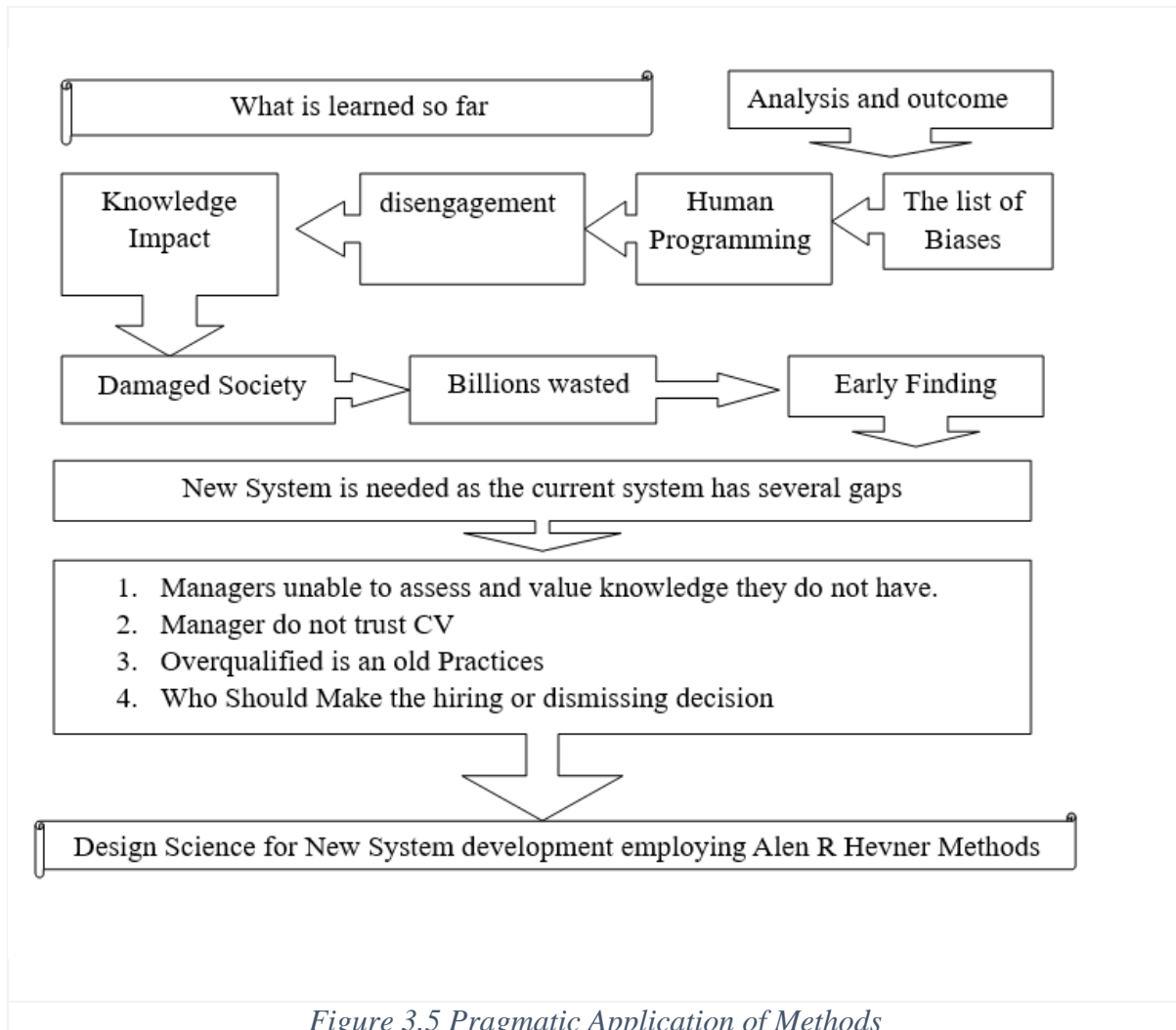
Figure 3.4 Hevner's 2004 Design Science Paradigms

The fourth criterion requires reflection on the design process of the artefacts – particularly in the case of theory or knowledge. Hevner expected researchers to ask themselves whether the knowledge justifies the artefact and the process. Addressing this criterion occurs in the knowledge base cycle. Meeting the fourth criterion can act as input to the next stage and an output of the Rigor cycle as a distinct contribution to knowledge. As such, the Rigor cycle can employ the theory from the knowledge-based and contribute to the knowledge base when the outcome of the Rigor cycle has adequate discovery. The fifth criterion relates to the design's evaluation and justification; alternatively, building and justifying. A sixth criterion requires the researcher to consider the artefact's utility and how it has been tested. This sixth criterion is managed as part of the Relevance Cycle because requirements contextually define the design benefit. The seventh criterion is related to the clear definition of the knowledge contribution, which is the outcome of the design cycle and sometimes the Rigor cycle.

This knowledge must be retrospectively added to the knowledge-based to ensure that future change considers lessons learnt. The eighth and final criteria critically compare whether the artefact design fulfils the original requirements. The final eighth criterion requires that the artefact – the outcome of the design – be tested in the environment. By definition, meeting these criteria should address the research question, i.e., since the requirements for the artefact were driven by the environment.

Artefact development occurs after the researcher better understands the gap in the system by completing the relevance and Rigor cycles. The relevance could be planned through suggestions and rigour by pragmatically applying suitable methods – see Figure 3.5 for an outline of proposed methods.

This thesis will employ the ‘built and justified’ approach in the design cycle because the design considers Kernel theory, which is the core of the design. The current design must justify this core as a tested theory that fetched a successful outcome. This means that the kernel theory has been pre-tested by other researchers.



*Figure 3.5 Pragmatic Application of Methods*

### 3.8 Adaptation of the Hevner framework

Hevner's cycle appears to be a perfect match as each cycle could be used to fulfil the contribution employing the outcome. This section highlights the initial plan for this thesis. One of the critical issues is that the study deals directly with people, for example, managers who could control the complex loop and people who should accept the system. At the same time, design science is a framework engineers and computer scientists employ to develop a novel solution; therefore, it is vital to understand and tackle the epistemological differences. So, this study first employs design science to overcome the algorithm or the process component in the study to help develop the system, including the steps and technical components; in addition, the process of testing the complex loop and making sure it fits for use and purpose.



Like so, the knowledge base helps the Rigor cycle in design science and includes methods that allow the capture of the people aspect, such as thematic analysis or ethnographic study as a data collection method to understand the people component in this research. Whereas testing the complex loop methods is embedded inside the natural loop of the method.

Hence, the project is divided into chapters aiming to mitigate the research problem. Chapter 4 demonstrates a complete design science cycle, including a Relevance Cycle, a Rigor cycle and the design cycle. The first design science cycle would define the requirements for the second iteration unless design satisfaction was reached from the first cycle. The Relevance Cycle harvests people's opinions, suggests solutions to the problem from a different perspective, and develops awareness through a survey that adopts the crowdsourcing method. This is only a start to understanding the system requirement and the domain issues. So the mitigation could be fulfilled in a further second cycle (chapters 5-7). The Rigor cycle adds rigour to the design by understanding the problem in more depth and generalising the problem by identifying how many biases could affect the process; those lists of biases could be used as a testing parameter in the design stage.

Equally, the Rigor cycle aims to connect prior knowledge, which refers to methods and processes that aim to solve the problem and find the causality of failure.

Alternatively, the suggestion stage fulfils this gap if the problem is novel; according to people's suggestions, the Relevance Cycle defines what is needed to solve the problem in this study. Therefore, the knowledge gained from the list of biases helps us develop a system with the principle that a system controls the human, and the human is the monitoring body. However, rigorous methods are enormously challenging to employ in design science research (Tichy, 1998; Zelkowitz and Wallace, 1998).

In the design phase, people's opinions and different options on the relevant mitigation opportunities are collected and tested in the employment process by running the parameter found in the Rigor cycle that shows how bias affects employment. In this way, the study can identify the best solution, and while bias is tested in the employment process, it is possible to examine where control loops might be placed due to repeated testing for bias in the same process.

In general, the structure of this study follows the scheme of Hevner et al. – see Figure 3.4. The design process also helps the researcher understand where the complex loops controlled by management can be used as a mechanism for continuous system improvement. The goal is to study how the artefact works and its efficiency in design science, not why it works. This is based on incorporating the ITIL loop methodology into the design and people's suggestions and results, as the system should achieve people's acceptance. Figure 2.1 is a storyboard for the project.

### 3.9 Conclusion

After viewing several methodologies and paradigms, this chapter concludes that Hevner et al.'s DSR framework is the best approach to fit the study's requirement, so Hevner becomes the research framework that will guide the solution design. Hevner et al.'s DSR framework remove subjective arguments

concerning the research structure, as some scholars argue subjectively that some steps could be done differently. However, following the methodology helps remove subjective arguments and allows the researcher to concentrate on developing an artefact that is suitable for use and purpose.

The following chapter, i.e. chapter 4, expresses a complete first iteration of the design cycle, including the Environment and Relevance Cycle, consideration of the Knowledge-based, and Rigor cycle.

First Design Science Iteration

## Chapter Four

### Identifying the Location and Scope of Bias in Employment Selection

#### 4.1 Introduction

The Equal Employment Opportunity Commission (EEOC) secures over \$500 million (per year) for victims of employment discrimination, handling over 200,000 inquiries concerning potential bias and discrimination, highlighting just how ubiquitous the problem of bias and discrimination is within the modern business culture. Thus, any system is biased if the system incorporates or fails to control decision-maker prejudice (Anderson et al., 2002). Allowing bias to remain unmanaged within a business can significantly impact the recruitment process and negatively impact knowledge and processes productivity inside a corporation, as shown in the literature review chapter. The employment selection process should consider Chappin's (2009) and Nonaka's Socialization theory (Nonaka and Takeuchi, 1995) because, according to Chapin( 2009), bias impacts knowledge negatively and therefore, it must be identified and removed otherwise inflated in socialisation phase according to Nonaka theory.

This chapter aims to employ Hevner's (2004) design science research (DSR) methodology as a research framework consisting of five stages described in the methodological chapter - to develop a system that mitigates biases in the employment selection process. By undertaking and answering the listed questions, we aim to identify: i) what biases impact employment selection, ii) the ideal location and functionality of the complex loop as a mechanism to help bias mitigation, iii) how to mitigate biases, iv) why bias happened so that maximum mitigation accomplished or the highest possibility to biases elimination in the employment selection system is fulfilled, iv) identify a list of biases that impact the employment selection process, v) demonstrate where and why bias occurs, and vi) highlight the need to develop an objective control framework within the employment selection process to work towards the elimination of the ubiquitous existence of bias within employment selection.

The research describes three steps and three cycles in this chapter, each step contributing directly to each cycle and indirectly supporting the other cycles. Combining those steps and cycles consists of one iteration of Hevner et al.'s design science methodology (figure 3.4), which produces a tentative artefact to solve the problem.

This chapter reveals high subjectivity in the selection domain, then i) identifies a list of biases that contaminate the employment selection process, ii) demonstrates where and why bias occurs, i.e., to support the future development of control mechanisms to help bias mitigation, and iii) highlights the

need to develop an explicit framework to work towards the elimination of the existence of bias within the employment selection process.

## 4.2 Summary of the Main Points Consider in the Chapter

This chapter considers bias as a systematic error in thinking (Kahneman, 2011). Humans are naturally biased, and psychologists have identified over 250 biases into various categories, such as memory, consciousness, statistics, logic, et cetera. (see Edith and Smaal, 2008). Nevertheless, appreciating how these specific biases impact individuals in business is challenging. For example, a simple literature search using the word 'bias' can return over a million articles, and over one hundred thousand articles contain both the terms 'bias' and 'employment'. This quantity of literature highlights the subject's relevance, according to Hevner (2004). However, it affirms the complexity and contextual stickiness of the issue (Hevner et al., 2004), thus making it hard to assimilate contextually where bias occurs and how it might be controlled. Scholars have identified numerous biases concerning name, face shape, skin colour, accent, and spelling ability (Derous and Ryan, 2007).

Literature has highlighted that managers will often consciously or unconsciously configure departments using principles, heuristics, and biases that serve their own best interests, i.e., rather than those that best serve the organisation's interests. Although the people around the manager and the manager themselves may not even be consciously aware of these actions, this mock bureaucracy - a term coined by Gouldner (1954) - can, over time, degrade organisational competency due to managers not selecting the most qualified person. Nonaka (2005) stated that since humans are the primary source of knowledge, skills, methods, and techniques, the management of tacit knowledge, which is critical to practical thinking, is critical to the success of any company or project (Sanchez, 2004).

Ideally, corporations should implement control mechanisms to ensure that they hire the person that best aligns with the role, i.e., from the perspective of knowing and not the person that best matches management bias. Interestingly, only limited literature considers the monitoring and prevention of biases in the current decentralisation decision-making era.

Mckinney (2015), for example, developed a control method to avoid consideration of unintentional biases, i.e., biases that employees did not intend to enact. Sadly, this could not control intentional biases, such as mock bureaucracy, the Ben-Franklin effect bias, the Dunning–Kruger effect, et cetera (Oswald et al., 2004). If, however, employees willfully choose to engage in bias, often to support personal ambition or gain, irrespective of the impact this will have on the business's reputation, such action is hard to employ control mechanisms that filter and stop such action.

Most studies considering controlling employment biases have identified a need for further research (Stockdale and Crosby, 2004; Dipboye and Colella, 2005; Brief, 2008). For example, Lieber (2009) provided a checklist of preventative recommendations, such as 'give an extra smile when in the face of the minority'. Lieber identified some intriguing failure factors, but he did not fundamentally address

the issue because a checklist only addresses the symptoms of bias and is only effective if staff members are actively involved in the process of bias removal.

Bias impacts all fields of work, and no one is immune from bias. However, with over one hundred thousand potential academic articles, it is almost impossible to identify from the generic literature theory concerning the full range of biases within the employment selection process using a general search. Accordingly, this chapter aims to harvest people's experiences of employment bias. By combining data from observations, surveys, online ethnographic interviews, and analysis of online social media, the authors intend to capture the stories of employment selection bias to achieve methodological saturation. Capturing employment selection bias stories facilitates the authors undertaking a focused literature search, achieving independent triangulation of results, thus forming a more contextually relevant list of biases. Moreover, by elaborating on the causes of biases, the authors aim to understand better where biases occur and how biases impact the employment selection process, thus supporting the design of future mitigation processes.

### 4.3 Methodology

As justified in Chapter 3, this research employs Design Science, popularised by Simon (1968). Simon developed an interest in the science of artefact development as a tool to improve the world's condition. Design Science Research (DSR) is motivated by a desire to solve a field problem rather than fill a knowledge gap and explain a concept. According to Simon (1969), DSR must: i) function between the problem space and the solution space, ii) be practical and focus on utility, profitable, or beneficial, which is in contrast with the positivist and constructivist / interpretivist paradigms whose primary concern is the discovery of facts or theories or hypotheses; and iii) be creative, iterative, and justified - which means that any created solution must be improved until the desired level of utility is reached.

Hevner et al.'s (2004) DSR framework selected for this research because i) the methodology owner is actively involved in modifying resources, and ii) secondary methods can easily be integrated. The full Hevner approach (see Figure 3.4) consists of three steps and three cycles; each step contributes directly to each cycle and indirectly supports the other cycles.

Combining those steps and cycles consists of one iteration, producing a tentative artefact to solve the defined problem. The Relevance Cycle bridges the contextual research project environment by understanding what, how, and why you are dealing with those parameters. The Relevance cycle allows us to identify the business needs, and in this study, people also suggested what businesses need to mitigate within the story narrative in the survey. As such, the Relevance cycle can stand (as required) as a complete piece of research drawn from the Environment (Hevner et al., 2004). The Rigor cycle connects the DSR activities with the scientific foundations, experience, and expertise that inform the research project, adding rigour to the design. The design cycle iterates between the core activities and evaluates

the design and processes of the research, i.e., the artefact is formed and shaped in the design cycle, which includes “developing and justifying” or “building and evaluating”. (see Figure 3.4).

The contribution to knowledge is based on the pragmatic philosophy that the artefact remains the main contribution, i.e., a prescriptive contribution to world knowledge. This perspective opposes traditional research, which provides descriptive contributions to world knowledge (Hevner and Chatterjee, 2010). The design proposition is fulfilled through abductive, inductive, and deductive reasoning, so the findings contribute to a real-world problem or context. Moreover, DSR supports the consideration of “satisficing”, i.e., continuing development until stakeholders are happy, thus facilitating the humanistic perspective (Vaishnavi and Kuechler, 2004; Peffers et al., 2008). Several researchers have adopted DSR ideas, and much literature has attempted to analyse the essential DSR elements and defend their legitimacy for DSR use in various research domains. As such, multiple guidelines and approaches discuss how DSR should be applied (for example, Takeda et al., 1990; Nunamaker Jr et al., 1991; Walls et al., 1992; March and Smith, 1995; Rossi and Sein, 2003; Hevner et al., 2004; Peffers et al., 2007; Kotzé, Van der Mer-we and Gerber 2015; and Pries-Heje et al., 2008a, 2008b). Despite the variations, most approaches follow similar research steps, i.e., problem identification, solution design, and evaluation stages (see Table 3.4).

*Table 4.1 Mapping and Comparing of DSR Frameworks*

	<b>Peffers et al., 2008</b>	<b>Takeda et al., 1990</b>	<b>Nunamaker et al., 1991</b>	<b>March and Smith, 1995</b>	<b>Vaishnavi and Keuchler 2004</b>	<b>Hevner et al., 2004</b>
<b>Problem identification</b>	Problem Identification and Motivation. Define the objectives for a solution.	Enumeration of problems.	Construct a conceptual Framework		Awareness of the problem.	Environments. Relevance.
<b>Solution Design</b>	Design and development.	Suggestion. Development.	Develop a System Architecture. Analyse & Design the System. Build the system.	Build	Suggestion. Development.	Knowledge. Rigour.
<b>Evaluation</b>	Demonstration. Evaluation.	Evaluation to confirm the solution. Decision on a solution to be adopted.	1-Observe and Evaluate the System.	Evaluate	Evaluation. Conclusion.	Design A- Build B- Justify

## 4.4 The Environment Step

According to Hevner, this step aims to examine the Environment related to the problem demonstrated by people, organisations, and technology; this step aims to understand what we read and search; this is often a representation of the literature review.

So, the goal is to understand the parameters that impact the problem and past kernel theory, which is the theory or methods employed previously to mitigate the problem, and how people attempted to mitigate the issues. Thus, to understand the Environment from the perspective of (People, Organisations, and Technology), a thorough examination of the literature review was conducted as a preliminary step related to the problem.

Psychologist scholars identified over 250 biases in the human brain and categorised them into groups like memory, statistics, consciousness, social, prejudice, et cetera. The list of biases demonstrated in Appendix L is collected from 109 peer review articles.

The literature identified the existence of over 250 biases, many of which appear to have a direct effect on employment. Those biases are defined as systematic errors in thinking that drive humans to make the wrong decision (Kahneman, 2011); those biases impact humans in general and could directly affect employment. Several gaps and inappropriate practices highlighted in the domain impacted employment selection and society. Likewise, many inappropriate practices have been highlighted in the domain, which impacts employment selection and society. Consequently, understanding the hiring process bias is critical to allowing the existence and influence of employment bias to be scrutinised.

To allow the critical breakdown of the employment selection lifecycle, we adapted Arthur's (2006) employment selection stages, which define two crucial stages of employment selection: i) the selection of the candidate stage and ii) the interview/selection stage. Within the selection of the candidate stage, the recruiter must: A) make automated or manual decisions/checks based on the candidate's CV; B) clarify information about the job role (if role/skills mapping is unclear); C) define information about the interview/selection process, and D) email applicants with a full interview and job details, those steps are listed in detail in the excel files.

Within the interview/selection process stage, several steps concerning the interview process and format are typically considered, including A) Meeting the candidate at the reception, B) providing an introduction at the interview, C) providing a background to the reason for the creation of the role; D) make any legal and education checks; E) discuss personal strengths; F) discuss personal weaknesses; G) receive any questions from the candidate; H) wrap up the interview; I) determine the outcome of the decision.

After conducting a literature review in chapter two, which is a mix of Scoping literature review narrative/ traditional literature review because the study needs thorough, critical, and objective analysis of the most recent research on a subject where the narrative or traditional literature review can provide this outcome; however, a Scoping review is needed because the subject has different components that are impossible to address all; furthermore, Hevner divided the literature review as an environment

according to the cycle and scoping review according to the parameter identification in each cycle. Scoping provided the breadth reviews are a "possible size and breadth of the available study literature preliminary assessment. The nature and scope of research evidence (often including ongoing research) is its goal. Scoping reviews are employed in design science (Nguyen, T., 2016; Muronga et al., 2019). Therefore after conducting a literature review of biases in the employment selection process, the authors were able to conclude that i) managers hold numerous biases that impact corporation knowledge and performance, ii) that the interview process includes numerous inherent biases, iii) that CVs are untrustworthy as the format is inconsistent, content is easily manipulated/invented, and mapping to the role is a complex process, and iv) the technology used in automatic selection is not fit for purpose. The author appreciates the current environment and highlights the need to consider in more detail, i.e., within the Relevance Cycle, i) What selection techniques currently exist in the 'selection of the candidate' step, ii) What methods are currently used in the 'interview/selection' step? iii) Who is usually involved in the employment hiring process?

Understanding the techniques, methods, and people allows the researcher to understand better the current options in the employment selection process and support mapping story biases to specific issues

#### 4.5 The Relevance Cycle

The Relevance Cycle highlights and considers what parameters and existing solutions are relevant to the practical Environment (Hevner et al., 2004). Since the goal of the Relevance Cycle is to elaborate an understanding of people's opinions and to collect information about people's contextual experiences, the researcher developed a questionnaire in the form of a survey to understand the current hiring process, i.e., current solutions in the hiring process.

The Relevance Cycle links the Environment and the problem's relevance to the design. This step consolidates the finding in the first step, i.e., the literature review and discovering new results. Since this stage identifies the multiple ways practitioners have previously unravelled the problem, it is ideal for identifying past possible solutions and defining its gaps. For example, Takeda et al. (1990) suggested using a focus group within this stage to highlight possible options presented from past knowledge that, if applied, could mitigate the problem.

Therefore, a survey was developed to collect people's experiences and opinions concerning the current employment selection process. The study was developed according to survey guidelines by Bernad Batinic, Michael Bonsnjak, and Andreas Werner, where valuable advice has been considered in this survey, such as avoiding long questions, incentives, and so on (Batinic et al., 2000) - see appendix A.

The survey link is (<http://www.community-centre.net/survey.htm>); start by gift and raffle with a random number generator to declare winners as a motivation mechanism. The link was posted on social media like Facebook, LinkedIn, Youtube, and Twitter. The link is distributed via different means, first, direct email to known people; Second, 1022 emails in a list have been purchased see appendix H. The link is



distributed to the emails provided in the list; see Appendix H. Those are random distributions to unknown people; however, the first set of questions in the survey, as shown in Appendix H, identifies inclusion and exclusion criteria, that is, the person who contributes should have been searching for a job for three roles and over 221.

Appendix H shows that a paid advertisement with social media like Facebook was also purchased to help distribute the link. The link was also distributed at Reading University, where the link was given on hardcopy paper. The same survey was also distributed as hardcopy paper to the surrounding area in Kingston upon Thames, Surrey. The analysis of the survey in Appendix A worth clarifying that Facebook blocked the link for around three months in 2019 when data was collected, which led to creating more than one link for the same survey by copying the survey in Microsoft form and reposting. This action creates admin issues and difficulty merging all forms into one Microsoft form. Thereafter, Facebook apologised, claiming that the blocking was automatic and then unblocking it, see Appendix A, H.

The survey has four parts; the first part introduces participants to the survey and describes what the survey aims to achieve. The second part of the survey collected details about the person's employment selection experience to assess the respondent's eligibility to provide relevant feedback. Only individuals who had an experience in the employment selection process were considered; the direct question in the survey, question number 7 and number 11, asks, "Have you searched for Job" also, How many jobs have you applied for in the past three years and how many interviews you have attended, those questions are considered as the inclusion/exclusion criteria. The third part of the survey contains open qualitative questions related to the employment selection process, for example, "In your opinion, what is the best method for evaluating the best candidate for this role? Describe your answer". This step was included because the new system aims to serve the people and should garner people's acceptance (Welbourne, 2014). Hence, avoiding rejection from people is core to the design science approach. The fourth part of the survey related to people's experience and domain observation. Since this fourth part is associated with the Rigor cycle, it will be discussed in section 4.8. In step aim to reduce expenses and effort in distributing the questionnaire, the merging of relevance and rigour data collection was undertaken because both steps required access to people. Consequently, merging data collection was necessary to reduce complexity. Merging relevance and rigour in data collection will not work in every case, but it does work in this case.

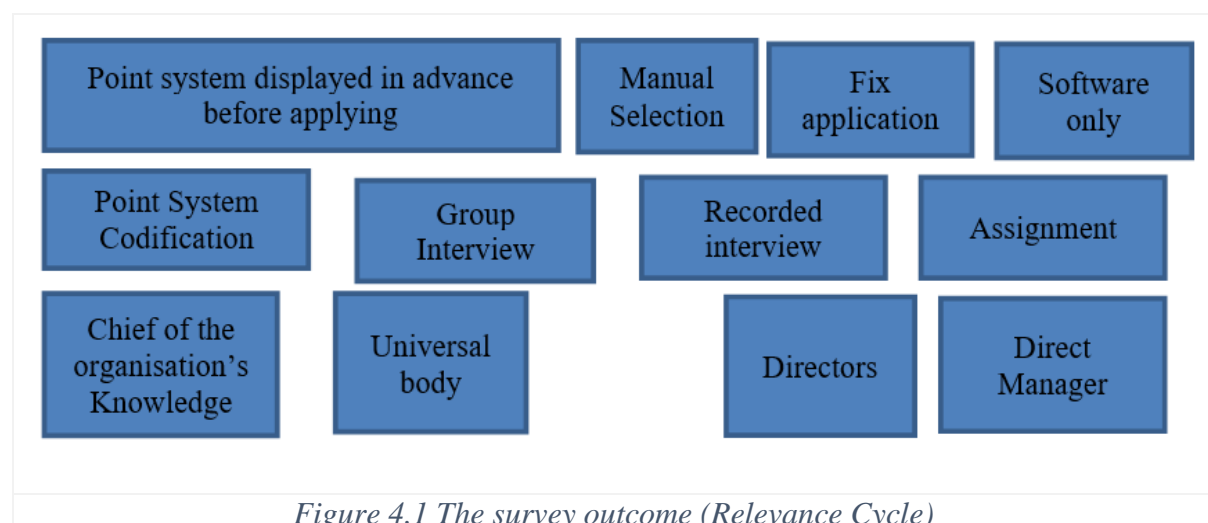
Ethical approval was gained from the University of Reading, School of Management Research Ethics Committee research to collect survey feedback data. In total, 50 participants answered the survey online in the US or UK with the criteria that they are over 20 and searched for jobs more than three times.

To identify gaps in the literature review, the survey participants suggested a different approach to mitigating the first, second, and third stages of employment selection, i.e., possible existing solutions to solve biases issues in the employment selection process. Although the survey sample size is small, this

smaller sample is justified because i) mainly qualitative data is being captured and processed, ii) saturation was reached as the same issues keep repeating, and iii) this survey is being used only to define the contextual relevance structure that will be applied to the data captured in the knowledge base analysis.

Qualitative textual data from open qualitative questions in the third section of the survey were analysed using thematic analysis. Themes are identified by analysing transcribed text (as in Nowell et al. 2017) to summarise and present commonly embedded meaning. As identified in the environment stage, ‘Techniques’, ‘Methods’, and ‘People’ categories were used to support theme coding, i.e., i) What selection techniques currently exist in the ‘selection of the candidate’ step? ii) What methods are currently used in the ‘interview/selection’ step? iii) Who is typically involved in the employment hiring process?

Analysis of themes showed that: 1) four techniques are currently/commonly used within the ‘selection of a candidate’ hiring step – i.e., i) a point system that is defined and determined in advanced, ii) manual assessment of candidate material without fixed pre-determined criteria, iii) fixed application, where the process and forms are consistent for all, and iv) software only – where candidates are tested using assessment software; 2) Four methods are currently used within the ‘interview/selection’ step – i.e., i) point codification, ii) group interview, iii) recorded interview, or iv) assignment; and 3) four people appear to be most commonly involved in the employment hiring process – i.e. i) organisation’s knowledge acquisition chief; ii) relevant individuals from the universal body (for example HR) within the organisation; iii) company directors who have a company-level perspective concerning what roles exist in the organisation; and iv) direct managers, who have a operational-level appreciation of what specific skills and knowledge is critical to perform specific roles (see Figure 4.1). The figure shows four ‘selection of candidate techniques, four ‘selection’ methods, and four ultimate ‘decision-makers currently involved in the employment selection process.



To summarise this stage, those parameters are people's suggestions to mitigate the problem:

- i) The prospect of CV selection,
- ii) The process to determine the role of the complex loop.
- iii) The decision-maker, who is the control component for the loops.
- iv) People's suggestions concerning the mitigate the biases in employment selection.
- v) Because people suggested different approaches, who should control the process?
- vi) Who should make the final decision?

In conclusion, this step examines selection methods, the selection process, and the approach used in the selection process.

#### 4.6 The Knowledge Base

The knowledge-based section concerns the appreciation of what methods should be employed to understand the problem and what approaches have been used historically to eliminate the defined issues. The knowledge-based step links past knowledge to the Rigor cycle by considering stakeholder experience. Accordingly, the knowledge contributed to the Rigor cycle by informing the design solution. Therefore, the knowledge-based section concerns the following questions: What methods should be employed to understand and eliminate such a problem? And What approach should be employed to tackle such an issue? This step aims to link past knowledge to the Rigor cycle from the method perspective and experiences and also justify the methods used in the Rigor cycle. So the knowledge contributed to the Rigor cycle and added rigour to the design solution. Hence whilst reviewing the literature on qualitative methods, the researcher considered several branches of Grounded theory; for example, Glaser and Strauss (1967), Glaser (1978) and Glaser (1992) when merged the theory after conflict and enforced the basics of grounded theory analysis. Then Strauss and Corbin (1990), Charmaz (2004), and finally, feminist ground theory within aims to discover the difference and most suitable. The review process directs the study to thematic analysis, focus group theory, and the use of ethnographic studies were all considered. The researcher concluded that the ethnographic study is the best approach to fulfil this study because the ethnographic literature demonstrates why this method is employed since it shows how other people benefit from these methods, supporting the research becoming rigorous and rigid. Although the description will be expanded in the Rigor cycle where the methods will be employed, as suggested by Hevner et al. (2004), it is essential to note that ethnographic methods are considered because such methods have unique features utilised to discover illegal activity. For example, several researchers use ethnographic methods to discover the nature of gangs and drug groups. Since many biases and mock bureaucracy are illegal behaviour with serious legal consequences, the nature of data collection and interviews has a different approach to a traditional interview.

To sum up, after reviewing several methods, the study concludes that qualitative methods are the best approach, with participant observation, cyber-ethnography, and participant interviews to capture both primary and secondary data concerning the existence of biases in the employment selection process. Additionally, thematic analysis is employed in the context of supporting a collection of data analysis.

So the next section is Ethnography literature, justification and the study approach.

#### 4.7 Justification of Ethnographic

Etymologically, ethnography derives from the Greek words "ethnos", which means nation or people, and "graphic", from 'writing'. Accordingly, ethnography seeks to identify and interpret every aspect of documented material by considering three components (presenter, nation, and presentation) (Balan, 2011).

Griffin and Howell (2008) state that "ethnographic fieldwork is an in-depth localised research process aimed at the description and analysis of cultural systems". This approach includes quantitative and qualitative data collection techniques, such as participant observation, surveys, and ethnographic interviews with key informants (Jahoda et al., 1972; Tedlock, 2000; Todd et al., 2004). The literature describes diverse types of ethnography, such as confessional ethnography (Schultze, 2000), critical ethnography Myers (1997), postmodern ethnography Harvey (1997), and Netnography Campbell et al., (2009). Nevertheless, all employ the same traditional anthropological model where the researcher is embedded in the relevant domain and seeks to understand society.

Ethnographic data collection techniques are categorised into observation, interviewing, and analysis of archival materials. Ethnographic scholars recommend organising and analysing the data to identify correlations and patterns and then synthesising the patterns to derive key insights. When data is collected from the internet within an engagement, this is called "Netnography". (Baskerville and Myers, 2015). Germonprez (2013), who engaged in Information Ethnography, suggested that Ethnography can also be used in Automated work or "information work", and several applications can be used to ease the process (for example, Orbis and Zyindex). Text-based managers (such as Tabletop), code and retrieve programs (such as QualPro), code-based theory builders (such as Atlas and Tinud), and conceptual network builders (such as Semnet and Nvivo) all provide analysis support. Sprinkler Software, an AI tool with a wide range of automatic analysis features, is considered the best tool for supporting Netnography. However, due to the high cost of the software, the researcher had to adopt a manual approach utilising a small browser application to automate the repetitive process of adding people to Facebook and other social media.

Gibbs (2007), cited in Angrosino (2007), claimed that ethnographers recommend no single standard approach; accordingly, it is essential not to highlight the use of any single standard approach because scholars agree that a custom-built method is necessary to meet the specific particular needs of the research. The lack of standardisation explains the improvisation to overcome the difficulty when the researcher consistently employs ethnographic study.

Although scholars have increasingly adopted ethnographic studies, some view ethnography more as an art than a science and ethnographers as soft scientists; still, the researcher's approach is more in-depth science than art. The reason is that data were collected from different sources on the internet (including social media), thus supporting data triangulation to substantiate the findings. The author's approach in Ethnography was also found to support the avoidance of anecdotal data and biases, i.e., through verification stages after identifying the list of biases.

The current study approach plans to collect online documents like job author writing, survey data and other data to understand and answer why biases exist, what biases exist, and how to depict the image to develop the solution. This process is because without understanding why and what, a researcher cannot develop the system. Since data can be collected from social media, YouTube, Facebook, news media documents, et cetera, it is logical to employ the power of hashtags in this study to improve content searchability and data filtration. In case repeatability is needed, the below hashtags were used: ("# employment, #jobseekers, #Interview, #hiring, #Hiring interview, #Job Interview, #Interview feedback, #Jobseeker issues) in order to understand and collect information concerning the issues in the job market until saturation of the data was reached (Jahoda et al., 1972; Tedlock, 2000; Howitt, 2007).

The current study is divided into phases; the first phase consisted of three approaches: a survey, observation and direct involvement, then the power of "Hashtag", where data collection occurred as soon as data emerged online. In the latter approach, the author searches for clips and data through advertisements on online media using incentives to encourage people to provide data regarding their issues. Methods used included digging in-depth on YouTube and collecting data from people sharing their arguments and experience in the domain. Moreover, the researcher utilised his in-depth expertise in IT to collect data from all forms of social media.

Participant observation, as a job seeker, was challenging for the researcher. Combining participation and observation facilitates understanding of the issue, i.e., as an insider conducting an interview, and supports the researcher's ability to describe the process more clearly to outsiders. Supporting this process, the author collected notes and data documentation after each participation, in line with suggestions by Bruni et al. (2004), Wolcott (2005), and Eriksson et al. (2008). A semi-structured interview with managers was also utilized to help understand the manager's perspective. Although the design ethnography technique recommended in-depth engagement with managers through observation of the action, the researcher (in part due to covid) was unable to gain the opportunity to engage with the observation. Still, substitute techniques can be used in the design science "Rigor cycle, cyber ethnography" to cover these gaps. As such, the researcher conducted semi-structured interviews with managers as part of open conversations, although design ethnography does not recommend this approach. Despite a minor methodological conflict, it was believed it was critical that the final system incorporates such adjustment and involves both job seekers' and managers' perspectives.

Employing open-ended questions as suggested by (Jahoda et al., 1972; Birmingham and Wilkinson 2003; Todd et al., 2004; Howitt, 2007; Tedlock, 2007;), the researcher asked managers four questions, intending to refute or prove the hypothesis identified as part of the literature review. In this way, the researcher could apply data triangulation to avoid researcher bias reflection (Howitt, 2007). The questions are highlighted in the Rigor cycle, which explains in detail the steps taken.

Understanding and documenting the research results is essential in establishing their importance. However, ethnographic research captures life as lived regarding the meaning of the research data because what might be meaningful to us as an observer might not make the same sense to others; the scientist refers to this as the ‘emic and etic’ approach. This principle affects the repeatability when converting each story to bias. One researcher might convert the story to several biases. In contrast, another researcher could convert the same story to one bias. However, saturation methods mitigate the overall outcome of the study; yet this is the nature of the qualitative study.

The fulfilment of ethnography methods through primary data collection allowed the development of a code, then underlying themes regarding where it happens, when it happens, and how it happens in employment. The primary themes were then categorised to discover global themes, which, in our case, were the biases. Accordingly, analysis of stories reduced YouTube, Facebook, survey, and observation stories into one or more bias mapping. Thus, the data collection allowed us to identify and triangulate biases that affect employment using a different source of data collection. The author intends to analyse the data in tables based on Acts, Actions, Events, Spaces, Objects, Goals and Emotions impacted by biases (as described in Angrosino, 2007).

This action was achieved in an Excel file by dividing the employment selection into stages based on Arthur’s employment selection process (2006). The data was then analysed to identify correlations and patterns to synthesise critical insights.

These outcomes helped to build the artefacts and the testing parameters. Likewise, each test helped to inform the researcher where complex loops and monitoring should be placed. The repetitive examination of the monitoring loop is the best approach to identifying the best place for the loop. Thus, this step provided the researcher with i) awareness of loop location, ii) awareness of biases involved, and iii) where the process could impact the candidates. The Rigor cycle will explain those steps in more detail.

Consequently, the ethnographic study's findings helped the researcher develop the first artefact in employing design science and testing the biases identified. They also helped improve researcher knowledge and awareness regarding prejudice and discrimination in employment selection, which helped the researcher better understand where control loops should be placed to achieve maximum bias mitigation. In the Rigor cycle, the researcher provides a detailed implementation description of the ethnographic method.

## 4.8 The Rigor cycle

### 4.8.1 Introduction

The Rigor cycle aims to add consistency and rigour by employing knowledge-based methods. The Rigor cycle aims to discover other biases that impact the employment selection process and use them as a parameter in the design cycle. The Rigor cycle commonly uses different approaches - for example, action research (Allen et al., 2000), ethnography (Baskerville and Stage, 2001), or design science **method** (Baskerville et al., 2009), to improve theoretical abstraction and knowledge generation within a design science project. The Rigor cycle is complete research to contribute to the artefact. One reason that Hevner et al.'s framework has been chosen is that adapting other methods could be employed without modification.

Implementing the Rigor cycle is essential to i) contextually cement the finding from the literature review and ii) discover other issues that might be skipped in the literature review, i.e., because it is practically impossible to review in detail the 100,000+ articles that include a discussion of employment and bias.

Accordingly, in the context of employment selection bias, stories were collected from people to add rigour to the design, i.e., to provide an awareness of how bias occurs so that a solution design can be considered. Thus, the stories reflect the biased experiences of job seekers and hiring managers in the employment selection process. This research used qualitative ethnographic data and methods, management interviews, and data from the qualitative survey (see Appendix B) storyboard.

Within the process that enabled this study to discover biases impacting the employment selection process, several ethnographic methods were employed to collect stakeholder stories. The researcher hoped that the findings from ethnographic data would help improve researcher knowledge regarding prejudice and discrimination in employment selection and thus inform the development of a first artefact in employing design science.

### 4.8.2 The approach and the cycle storyboard

The ethnographic method aims not to hypothesise, theorise, or generalise but to discover gaps in the system through data collection. Each piece of data, termed a 'story', represents a gap in the system that allowed discrimination or bias to occur. Thus, the ethnographic journey is a step-by-step analysis of multiple employment selection life cycles.

The first set of ethnographic data was collected using cyber-ethnography, i.e., an online survey and a range of online material sources that harness the power of the "Hashtag". The researcher joined multiple Facebook and LinkedIn pages related to 'employment issues' and collected a range of secondary stories concerning bias in the employment selection process. Data was also collected by watching multiple YouTube videos, i.e., where people posted their stories concerning discrimination. In total, the researcher explored over 100 YouTube clips, engaged with over 50 entries on Facebook, numerous on Twitter, over 30 stories from LinkedIn, and 35 from a range of online articles. In addition, the researcher

collected experiences and critical comments from several online career writers regarding the job market and the hiring domain, the same approach adopted by Lima et al. (2015) study. Although these are non-peer reviewed articles, they have high value because an expert in the domain has determined the content as critical. All activities were undertaken to maximise the range of captured stories and the chance of bias saturation.

The researcher collected the second set of ethnographic data, i.e. by undertaking conscious participant observation when looking for work, i.e., becoming a job seeker, looking for a job, and attending several interviews. This job-seeking activity was completed with the honest intent of finding employment. No manipulation of events was made to cheat or manipulate employers and to experience specific aspects of the employment selection lifecycle. Combining hands-on participation and personal observation facilitated a first-hand researcher understanding of the current employment selection process and the issues that occur; therefore, notes and data documentation were collected after each interview – as defined by Wolcott (2005), Bruni et al. (2004), and Eriksson et al. (2008). Thus, the ethnographic journey is step by step, as below, where the finding of this journey discovers seventy-seven bias impacts employment.

Figure 4.3 below demonstrates the main steps taken in this journey, step by step.

- Synthesis of all biases that affect humans to test them as psychologists demonstrated and classify them to memory, statistic, consciousness, et cetera
- Collect all biases listed and identified by the researcher through the peer review article that directly impacts employment.
- Apply for ethical research approval for a paper, online, and interview.

This action is because the researcher is already aware that the distribution of the study will not fetch enough responses, as after survey gets ignored without direct reimbursement that requires a high budget. In comparison, certain companies offer up to 80 GBP for survey completion as a budget while conducting the study. This is especially the case in IT, which requires data from employees who have no extra time to complete the survey.

Hence, interviewing managers is the second approach to data collection to examine both sides of the story. The second reason for an ethnographic interview with managers is that an ethnographer expert recommends this action because It is difficult for the researcher to merge himself into a transcendent society to collect data, particularly for a busy manager with hiring authority.

Figure 4.3 is the storyboard for this research.



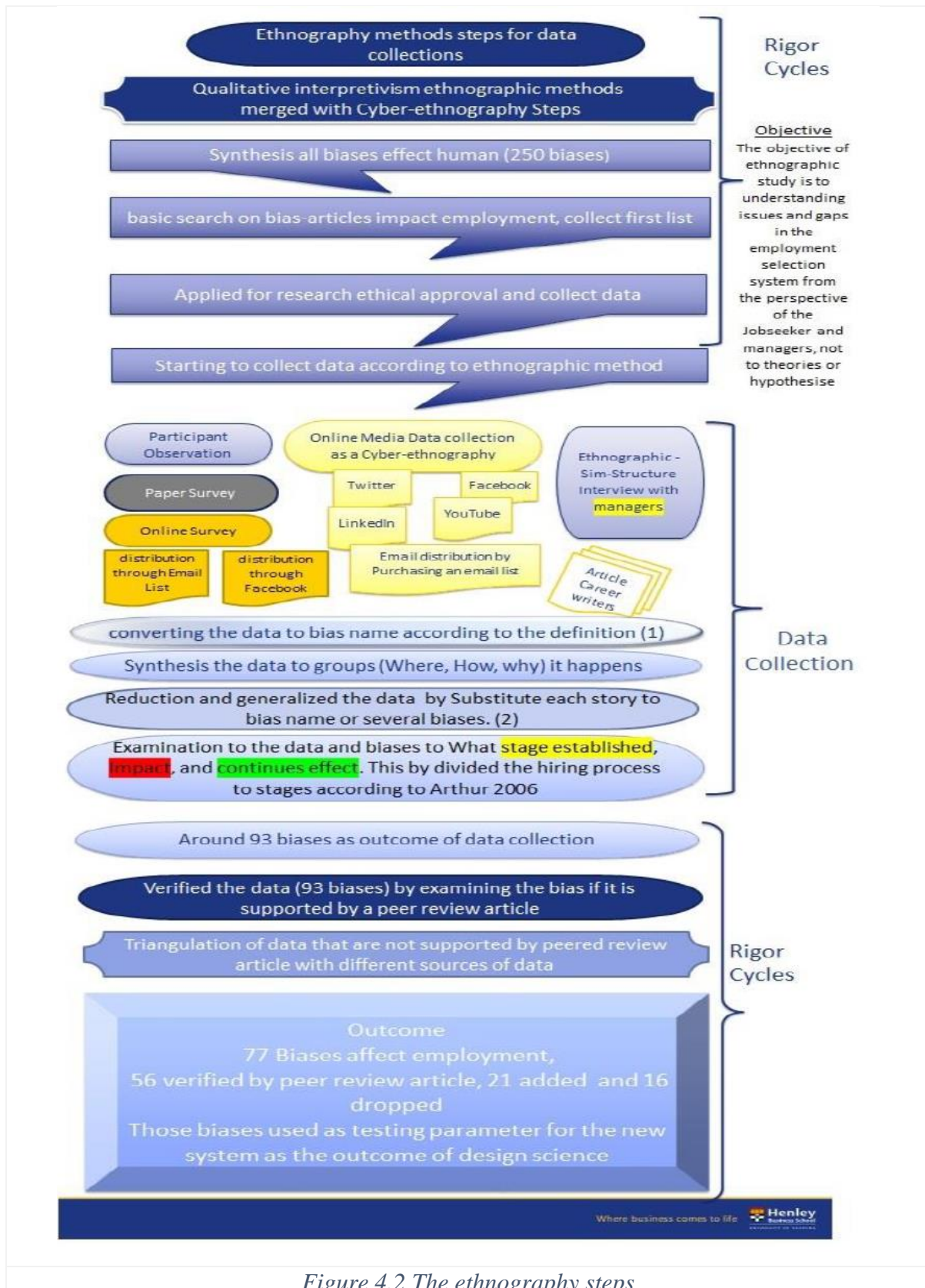


Figure 4.2 The ethnography steps

### 4.8.3 Ethnographic Data Collection

The survey distribution commences in several directions: a two-page website with incentive as a raffle, and a 20GBP voucher as a computer repair voucher for the personal researcher company "Community Venue Centre". "<http://www.community-centre.net/survey.htm>"

The survey design was based on qualitative data collection and people's observation, sharing their experiences; additionally, the survey's emphasis is based on literature review findings, as demonstrated in Appendix A and according to Batinic et al. (2000). Therefore, the survey has four parts, as stated in the Relevance Cycle. The first part is the incentive to motivate people to complete the survey. The second part is only a checking mechanism if the contributor is qualified to provide the information; otherwise, the data is dropped or ignored. The third part is related to the suggestion stage, as stated earlier. The fourth part is related to people's experience and observation of the domain related to data collection for the ethnography or Rigor cycle. Then, the website or survey links are distributed using various methods. For example, leaflet links are posted on social media with a paid advert to maximise the distribution and all public platforms, links are sent via emails, a list of emails is purchased as data, and paper surveys are distributed.

The first set of ethnographic data was designed to collect data using cyber-ethnography, i.e., an online survey and a range of online material sources that harness the power of the "Hashtag". The same survey link (<http://www.community-centre.net/survey.htm>) but only section **four** was used in the Ethnographic study. Therefore, again, the survey links have been posted via social media like Facebook, LinkedIn, etcetera, and paid advertisements to boost the visibility of the link. Also, the link is distributed by paid email list where it reaches thousands of people. Facebook blocked the link for months, which caused administrator issues, which led the researcher to copy the survey link and post it again; then, the researcher had to merge those data manually.

The second set of data collection:

The second set of data collection is the observation of the public domain using random cases since downloading this data validated the copyright policy of the provider, and the existence of this data is not static as it could vanish from the internet; saving the link means nothing. Therefore each story has been converted to bias according to the definition; some stories are converted to more than one bias; however, this subjectivity is eliminated by data saturation.

This is qualitative data collection, so the number has no meaning because only saturation stops the process. However, due to special requests, the quantitative data are approximate because the researcher did not collect this data, and each story was converted to bias immediately in the Excel file.

This study mimics (Project Implicit ) in 2020, which aims to convert implicit bias to explicit by collecting random stories from any adult facing bias or discrimination. The Implicit Project was funded

in 1998 by three scientists – Tony Greenwald (University of Washington), Mahzarin Banaji (Harvard University), and Brian Nosek (University of Virginia). The (Project Implicit) aim is to mitigate implicit bias and make it explicit, where the researcher contributed (Project Implicit), examining the process and sharing bias as well. Therefore, there is no exclusion criterion as all sites looked at are contributions and stories of people who faced discrimination or bias; thus, exclusion to any case could be considered researcher biased. Nevertheless, in the youtube video, some clips were excluded as the video has (# job) but talks about a different subject or advising about a job. Thus, only people who talked about job problem was included as inclusion. To sum up, the exclusion/inclusion criteria were implicit according to the researcher's assessment of the age of the person who addressed the story and if the story related to job discrimination and bias.

The researcher joined multiple job seeker forums and Facebook groups, accessed numerous LinkedIn pages and reports related to ‘employment issues’, and collected a range of secondary stories concerning bias in the employment selection process.

The researcher's participant observation collected the second round of data.

#### **Job Seeker Forums:**

The researcher interacted with individuals seeking employment, asking questions concerning the employment selection process and collecting the responses, harvesting their observations and opinions.

In the case of replication, future researchers do not need to engage with the same pages and individuals, but data saturation mitigates the replication regarding data collection from different samples.

The conversation and the engagement with participants are crucial in net ethnography, so the researcher emerged in the domain and engaged with participants to get more information. Additionally, each piece of data represented a story and was captured by talking to people and collecting data. So converting each story to biased names or several biased names was required. This was easily achieved by adding and mapping biases within the Excel sheet. See the example below, where Facebook pages allow a researcher to interact with users. The researcher interacts with around seven to ten pages; each page has several job stories posted by people.

1. <https://www.facebook.com/pages/Jobcentre%20Plus/250559295289519/>
2. <https://www.facebook.com/Employment-and-unemployment-database-710025995873984/?ref=bookmarks>

### **Youtube / Social Media Videos:**

Data was collected by watching multiple YouTube videos, i.e., where people posted their stories about discrimination. It is crucial to consider "emic and etic", thus linking each story to a key bias name;

For example, the second link below was mapped to "impact bias, selective perception, extrinsic incentives bias, et cetera".

Other researchers might link those stories to more biases; however, data saturation is the key. The researcher viewed several stories around 25-35 clip where some might not link to a job but has the #tag job; therefore, for any story discussing job issues in English, not concerning the personality agenda, remember the browser search engine setup to UK and US.

- <https://www.youtube.com/watch?v=gvAF9mboxFM>
- <https://www.youtube.com/watch?v=1-dKSE1c0i8>

### **LinkedIn and Career Writers Report:**

Around 30 stories were gathered from LinkedIn, see example below and 35 from online non-peered review articles posted on LinkedIn and in different places. Besides, the researcher collected experiences and critical comments from several online career writers regarding the job market and the hiring domain, an approach employed by Lima et al. (2005).

[https://drive.google.com/file/d/1\\_Pyo41uAX018qNDqS5qyw52YVHtL5so/view?usp=sharing](https://drive.google.com/file/d/1_Pyo41uAX018qNDqS5qyw52YVHtL5so/view?usp=sharing)

The interpretivistic ethnographic study is not interested in collecting quantitative statistics regarding the data but rather in understanding the meaning of data related to the study.

Accordingly, interpretivism ethnography ignores other noise because it is not part of the study's interest. As such, the data was triangulated to avoid anecdotal evidence and a subjective argument.

The researcher collected the second set of ethnographic data, i.e. by undertaking conscious participant observation when looking for work as described before, i.e., becoming a job seeker, looking for a job, and attending several interviews. Notes and data documentation were collected after each interview, as defined by Wolcott (2005), Bruni et al. (2004), and Eriksson et al. (2008).

**Google Artificial Intelligence** is essential for repeatability; thus, it must consider. Google's search engine has an artificial intelligence component that helps find more data from the same category when contributing to and registering with channels. When conducting repeatability research, it is crucial to

enrol in those channels; otherwise, we will get different results. It is also essential to set the browser to UK and US or use two browsers so that data will automatically come after registering the same account with all online media.

This is a qualitative interpretivism study, so data sampling has no meaning but data saturation and random data collection.

#### 4.8.4 Survey and Interview Data Collection

**Qualitative survey** - The qualitative survey (see Appendix A) was designed to capture specific qualitative data from various people concerning observations and experiences that were not directly considered in online reports. As discussed in the Relevance Cycle, the survey has four parts; remember that only some section of the survey was used in Relevant, and some were used in the Rigor cycle. Therefore, the first part incentivises people to complete the survey. The second part is only a checking mechanism if the contributor is qualified to provide the information; otherwise, the information is dropped or ignored. The third part is related to the suggestion stage. The fourth part is related to people's experience and observation of the domain related to data collection for the ethnography or Rigor cycle. Qualitative textual data from open qualitative questions in the fourth section of the survey allowed us to capture people's experiences and observations of the domain.

**Management Interviews** - semi-structured interviews with snowballing sampling conducted with four managers, i.e., to collect the employer's perspective on employment selection. Community leaders identified four white male managers involved in hiring after the researcher requested support from the community leader in this case. The four managers are members of the local church community, and those are selected due to availability.

The four managers are as below:

<i>Table 4.2 The Manager's demographic information</i>					
	Participant number	Year of experience	Nationality	Gender	
	1	30	British	male	
	2	30	British	male	
	3	35	British	male	
	4	40/ retired	British/Irish	male	

The managers verified that they had been involved in hiring staff at the beginning of the conversation. This interview was conducted during COVID-19 Time.

The questions used in the management interviews were based on the literature gaps and were designed to follow Howitt and Cramer's guidelines (Howitt and Cramer, 2007). Each question aimed to understand a specific aspect of biases and practices for employment. The open questions asked were:

- Q1 On what basis do managers in your position select a candidate when you are hiring?
- Q2 How do you determine what knowledge you don't currently have and how it will benefit the company?
- Q3 How do you make a final decision between two candidates who have similar experiences?
- Q4 Do you consider higher-level skills or qualifications (for example, a PhD) for a job that only requires lower-level skills or qualifications (for example, BSc or MSc)?

All employment bias stories, i.e., from ethnographic and surveys/interviews, were captured and processed by applying thematic analysis.

#### 4.8.5 Employment Bias Story Analysis

In order to analyse qualitative stories, ethnographic scholars recommend organising textual data to identify correlations and patterns, synthesise the data and derive critical patterns and insights. Scholars suggest grouping theming context into 3-10 categories (Angrosino, 2007).

The researcher adopted a manual approach to coding in order to i) organise and analyse the text from multiple stories with specific consideration of "where the bias happens" (grey), "how the bias happens" (light blue), and "why the bias happens" (purple) - see table 4.3, and ii) show which of the 255 biases identified by psychologists through the literature could be potentially involved in the employment selection. The number of occurrences of a specific bias, i.e., the number of times a specific bias was mentioned across stories, was not recorded; since this information was deemed of limited value to the appreciation of bias control.

*Table 4.3 Example of Theming*  
when the bias occurred (grey), how the bias occurred (blue), and why the bias happened (purple).

Managers and directors do not trust CVs unless it comes from someone they know. CV – Data search – no authentication
Managers do not understand CVs due to lack of knowledge, or multiple terminologies used in CVs due to use of technical language / terminology for the same tasks. CV – Various technology complexity – lack of deep knowledge and understanding
Job Name and the title have nothing to do with the functionality of job. Job names are expressed/interpreted differently according to level of company knowledge. At the corporation – definition the job function – mock-bureaucracy-pushing for role
The job market is controlled by feedback and hidden agenda. At the selection stage – ignoring unconscious and conscious bias – unknowns, network
The manager abused the authority given to him, for example a male employer interested in a female employee. If she rejects him, the manager uses his authority against her application. At the corporation level – bad managers, bias, etc. – lack of manager monitoring and networks
Managers reject someone who is better educated and s(he) is possibly considered 'a threat'. CV or interview – bias, manager cares about themselves – no monitoring of the decision.
Managers hire based on the characteristic matches – not skill ability. At the work level – Through a process of work, hire, dismissing – no monitoring, networking, bias



### 4.8.1 Bias Triangulation and mapping

This stage ensures that each bias presented in the data collection impacting employment selection exists in different sources of data collection to achieve methodological triangulation.

Accordingly, this step aims to avoid anecdotal data and examine if either i) the bias is explicitly mentioned or studied by a psychologist or behaviour management with empirical evidence that this bias impacts employment. ii) indirectly triangulated with different sources of data collection (i.e., method triangulation).

The rigour analysis and findings highlight the difference between this stage and the bias discovered in a literature review. In the literature review, the researcher searched for bias in general. Where this stage, after identifying biases through story collections, the researcher searched to identify whether a specific bias is mentioned, discussing the employment selection process in peer-reviewed articles. If bias is not mentioned directly or indirectly, the researcher checks if more than one data collection method identified those biases. This step differs from an exploratory literature search, as the researcher searches for specific biases and discovers new biases that are yet to be studied by scholars.

This process is applied as it is almost impossible to search all articles discussing bias and employment. However, it is possible to search for a specific bias concerning employment after identifying it.

Although ninety-three possible biases were identified by the Rigor cycle from ethnographic story analysis, additional cross-validation (i.e., triangulation) of the bias occurrences was critical to counter i) the anecdotal nature of qualitative bias stories and ii) the impact of researcher subjectivity when interpreting participant stories and mapping stories to biases. As a result of story analysis, the researcher was able to review the literature with a more specific appreciation of the context of bias occurrence; in case the bias does not exist in a peer-reviewed article, bias should appear in different data collection methods. Applying this information, the researcher could easily identify whether the specific bias had already been mentioned and studied as employment impact bias directly or indirectly in a peer-reviewed article or whether this bias was yet to be discovered empirically by scholars who research bias. When bias existed in non-peer-reviewed articles, it should appear in different data collection sources; otherwise, the bias dropped from the list. (See Table 4.3) the biases discovered using peer and non-peer-reviewed articles. Furthermore, identifying where the story happens and why it happens helps in articulating the loop position and location (see Figure 4.2)

*Table 4.4 Example of triangulation, Ethnographic Methods*

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Bias list that affects employment					
	Peer reviewed	article based on expert	data collection through study	triangulated	note
List of All biases					
Bias list that affects employment					
	Peer reviewed	article based on expert	data collection through study	triangulated	note
List of All biases					
Ambiguity effect		<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	The tendency to avoid options for which the probability of a favorable outcome is unknown. [10]
Anchoring or focalism		<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>			The tendency to rely too heavily, or "anchor," on one trait or piece of information when making decisions (usually the first piece of information acquired on that subject).
Availability heuristic	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to overestimate the likelihood of events with greater "availability" in memory, which can be influenced by how recent the memories are or how unusual they are.
Beiler bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	An effect where someone's evaluation of the logical strength of an argument is biased by the believability of the conclusion. [22]
Bias blind spot	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to see oneself as less biased than other people, or to be able to identify more cognitive biases in others than in oneself. [25]
Confirmation bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to search for, interpret, focus on and remember information in a way that confirms one's preconceptions. [28]
Courtesy bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to give an opinion that is more socially correct than one's true opinion, so as to avoid offending anyone. [34]
Distinction bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to view two options as more dissimilar when evaluating them simultaneously than when evaluating them separately. [40]
Dunning-Kruger effect	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency for unskilled individuals to overestimate their own ability and the tendency for experts to underestimate their own ability. [42]
Endowment effect	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency for people to demand much more to give up an object than they would be willing to pay to acquire it. [46]
Impact bias		X	X	X	The tendency to overestimate the length or the intensity of the impact of future feeling states. [67]
Optimism bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to be over-optimistic, overestimating favorable and pleasing outcomes (see also wishful thinking, valence effect, positive outcome bias). [81][82]
Overconfidence effect	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	Excessive confidence in one's own answers to questions. For example, for certain types of questions, answers that people rate as "99% certain" turn out to be wrong about 90% of the time.
Pygmalion effect	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The phenomenon whereby others' expectations of a target person affect the target person's performance.
Reactive devaluation	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	Devaluing proposals only because they purportedly originated with an adversary.
Regressive bias		X	X	X	A certain state of mind wherein high values and high likelihoods are overestimated while low values and low likelihoods are underestimated. [5][90][91][unreliable]
Selection bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to notice something more when something causes us to be more aware of it, such as when we buy a car, we tend to notice similar cars more often.
Selective perception		X	X	X	The tendency for expectations to affect perception.
Semmelweis reflex	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to reject new evidence that contradicts a paradigm. [31]
Singularity effect		X	X	X	The tendency to behave more compassionately to a single identifiable individual than to any group of nameless ones. [27]
Social comparison bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency, when making decisions, to favour potential candidates who don't compete with one's own particular strengths. [92]
Social desirability bias	<a href="#">https://doi.org/10.1016/j.jm.2014.04.001</a>	X	X	X	The tendency to over-report socially desirable characteristics or behaviours in oneself and under-report socially undesirable characteristics or behaviours. [93]

Evidence was identified, i.e., within peer-review literature, to support the existence of fifty-eight of the ninety-three employment selection process biases (see Appendix). Evidence was also identified within non-peer review literature (and online articles or any other source of data collection) for the existence of an additional nineteen additional biases (see Appendix C). Accordingly, the Rigor cycle (via triangulation of ethnographic stories and literature) objectively identified 77 biases that have been found to impact the employment selection process (see Appendix C and D for a final list of the 77 biases).

The step that supports consideration of bias control, using ethnographic theming data from the perspective of job seekers and managers, identifies 77 triangulated biases in the context of Arthurs employment hirings life cycle stages (2006) - see Appendix D.

The bias identification process includes consideration of both i) the initial selection of the candidate and ii) the interview/selection stages. Within the 'selection of the candidate' stage, the recruiter must: A) make automated or manual decisions/checks based on the candidate's CV; B) clarify information about the job role (if role/skills mapping is unclear); C) define information about the interview/selection process; and D) email applicants with a full interview and job details. Within the 'interview/selection process' stage, a number of steps concerning the interview process and format are normally considered, including A) Meeting the candidate at the reception; B) providing an introduction at the interview; C) providing background to the reason creation of the role; D) make any legal and education checks; E) discuss personal strengths; F) discuss personal weaknesses; G) received a question from the candidate; H) rap up the interview; I) determine the outcome of the decision, and J) highlights a continuous effect.

Each process or step could generate bias or drop bias seeds that could have an effect or an impact later shown in other stages or steps. See Appendix D1 and D2 for full details of, respectively, job-seeker and manager perspectives concerning the impact of biases by mapping biases. For example, in the Arthur lifecycle, a bias is formed {yellow}, where a bias creates impact {red}, and where there is a continuous impact beyond the process {green}, and by separating consideration of bias from perspectives of job seekers and managers, the researcher was able to offer a considerable appreciation as to where control mechanisms need to be considered to mitigate the existence of bias. This action is vital for determining where the complex control loop should be used to prevent the formation and occurrence of bias. (See Table 4.4 and 4.5 as a sampling of the process)

*Table 4.5 A sample of impacting biases*

Sample of impacting biases, from the Job Seeker's Perspective, biases were formed (Yellow), bias impacts (Red), and Continuous impact (green)

For a full list, see Appendix D1.

Interview stages	Recruitment				Company Interview											
	A	B	C	D	A	B	C	D	E	F	G	H	I	J		
Ambiguity effect																
Anchoring or focalism																
Availability heuristic																
Belief bias																
Bias blind spot																
Confirmation bias																
Courtesy bias																
Distinction bias																
Dunning–Kruger effect																
Endowment effect																

*Table 4.6 A sample of impacting biases*

A sample of impacting biases from the Manager's Perspective, where biases formed (Yellow), bias impacts (Red), and continuous impacting (Green).

For a complete list, see Appendix D2

Interview stages	Recruitment				Company Interview											
	A	B	C	D	A	B	C	D	E	F	G	H	I	J		
Ambiguity effect																
Anchoring or focalism																
Availability heuristic																
Belief bias																
Bias blind spot																
Confirmation bias																
Courtesy bias																
Distinction bias																
Dunning–Kruger effect																
Endowment effect																
Ambiguity effect																
Anchoring or focalism																

The synthesis of the biases happens in more than one stage, starting from the first stage of the preliminary literature review is used to clarify which specific biases affect employment selection so those biases are tested and do not need to be triangulated. Since they are collected from the preliminary study of peer review articles, adding the biases collected through stories in the Rigor cycle "ethnography" to form a complete list of biased impact employment. For a full list of biases, see Appendix C.

Appendix D highlights where the 77 biases are formed; articles verified 56, and 21 were discovered in 2020, with no link to peers-review articles with explicit assessment.

The search criteria on each bias, using "bias name" AND "employment hiring", then "bias name" AND "recruitment" also, "bias name" AND "Hiring". The list of bias still active and could be used as a bias catalogue for employment. Also, some psychological or behaviour scholars have not assessed some bias; therefore, they now have a clear image that bias impacts employment and can assess the impact using their research methods and approach.

Thus, those could be an opportunity for psychologist researchers to examine the effect and outcome in detail and break down the impact; the psychologist scholars demonstrate in their article uses people as sampling and exam the effect in detail; see tables 4.6.

The detailed impact is out of the study scope, and it is an approach employed by psychologists as each article examines one bias and its continuous effect on humans with precise measurement.

So, in brief:

- Synthesis of all biases that affect humans.
- Collect all biases listed and identified by the researcher through the peer review article directly impacting employment, preliminary search.
- Apply for ethical approval.
- Data collection through participation where the researcher merged in the domain and became job seekers, converting each story to a biased name or list of biased.
- Collecting data through cyber-ethnography, like Facebook, Youtube, et cetera and mapping them to biased names.
- Collect data and convert them to bias through career writers' stories.
- Interview with managers and convert the interview to them where it happens, How it happens, and why it happens.
- Theming steps ( 6 themes)
- Triangulating the discovered biases only.
- Synthesis of the biases first, the preliminary list; second, the triangulated ones; third, the one identified from the secondary search has sources in the literature, so those do not need to have a different data collection method.
- The uniqueness existing in the thematic analysis dropped.

- The information on bias demonstrated in career writer documents and other data collection methods was considered in the 77 lists of biases.

Table 4.7 The 21 discovered biases
1-Ambiguity bias
2-Focalism bias
3-Authority bias
4-Context effect
5-Cryptomnesia bias
6-Egocentric bias
7-Extrinsic incentives bias
8-Google affect bias
9-Group attribution error bias
10-humour affect bias
11-Illusion of external agency bias
12-Impact bias
13-Regressive bias
14-Regulatory issues bias
15-Reporting bias
16-Semmelweis reflex bias
17-Shared information bias
18-Singularity affect bias
19-Social comparison bias
20-Tip of the tongue phenomenon bias
21-Zero-sum bias

### 4.8.2 The Conclusion of the Rigor Cycle

This study is a summary of biased literature, demonstrating which biases impact employment. Einstein once said, “If I had only one hour to solve a problem, I would spend up to two-thirds of that hour attempting to define the problem.”.

This chapter has provided a better understanding of why and where biases happen, which gives us significant knowledge and wisdom to overcome this bias by employing the loop. Herbert Simons once claimed that “solving a problem simply means representing it in a way so as to make the solution transparent.”

The research shows that stories identified seventy-seven biases that potentially impact the employment cycle or employment selection process – see Appendix C; since biases identified by peer-reviewed articles or data collection are ignored. Moreover, some biases had the same meaning but were fit under another bias name. For example, ‘Beauty bias’ has the same impact as the ‘Women are wonderful’ effect and ‘social desirability bias. Accordingly, the study does not need to duplicate consideration of both biases, as they represent the same thing but with different names.

The ethnographic research was published as a presentation at the five World Conference on Qualitative Research (WCQR2021), held online (Virtual Conference) from 20<sup>th</sup> to 22<sup>nd</sup> January 2021.

## 4.9 The Design Cycle

### 4.9.1 Introduction

The design stage aims to develop and justify the artefact in progress, i.e., develop an artefact that can mitigate biases in the employment selection process. As such, each cycle tackles a specific artefact aspect. In the “Relevance Cycle”, the researcher collected data through a survey and was able to define i) four ‘selection of the candidate’ techniques, ii) four ‘selection’ methods, and ii) four people who are the ‘ultimate decision maker’ in the employment selection process (see figure 4.2). So, the design stage aims to develop and justify the artefact in progress. This cycle is a reflection and outcome of all previous cycles. During the “Relevance Cycle”, the researcher collected data through a survey to evaluate an acceptable method as an alternative to the current employment techniques.

### 4.9.2 Approach for Artefact Development

The question being addressed in this section is, which of the solution suggestions proposed in the Relevance Cycle is the best method, i.e. resulting in less bias being employed in the new design?

The outcome of the design step is a tentative artefact that demonstrates bias mitigation in the employment selection process shown in the design. Therefore, the researcher mapped specific bias types to solution suggestions, allowing us to identify the solutions that have the least number of biases. For example, using a “zero” to represent no bias and “One” to represent bias and placing them in an Excel file (see figure 4.4).

			Ambiguity effect	Anchoring or focalism	Availability heuristic	Belief bias	Bias blind spot	Confi
1								
2								
3								
4	Case 1-Selection	Point system displayed in advance before applying	0	0	0	0	0	
5	Case 2-Selection	Manual Selection	1	1	1	1	1	
6	Case 3-Selection	Fix application	0	0	0	0	0	
7	Case 4-Selection	Software only	0	0	0	0	0	
8	Case 5-Interview options	Point System Codification of Knowledge	0	0	0	0	0	
9	Case 6-Interview options	Group Interview	0	1	1	1	1	
10	Case 7-Interview options	Recorded interview	?	?	?	?	?	
11	Case 8-Interview options	Assignment						
12	Case 9-decision	Chief of the organization Knowledge Manager	1	1	1	1	1	
13	Case 10-decision	Universal independent body						
14	Case 11-decision	Directors	1	1	1	1	1	
15	Case 12-decision	Direct Managers	1	1	1	1	1	
16								
17								

Figure 4.3 Design cycle - Merging relevant and rigorous cycles.

The researcher determined that sixty-four possible employment selection processes existed due to the existence of  $4 \times 4 \times 4$  selections (i.e., three choices in series with four possible outcomes – see Figure 4.5).

The researcher appreciates that determining the employment selection process by choosing the ‘selection of the candidate’, ‘selection of the methods’, and ‘selection of the decision maker’ appears to be a straightforward generalisation of all possibilities. However, based on the analysis of survey data, three simple choices can generate sixty-four possible employment selection options (see Figure 4.10). For example, one possible employment selection process might include manual selection as a candidate selection technique, group interview as the selection method, and directors as the people making the ultimate selection decision. Thus, each of the 64 options has various biases inherently incorporated into the process.

Initially, the researcher had hoped to explicitly assign several biases to each selection (i.e., biases x, y, and z always exist in the ‘manual’ selection of the candidate) – see Figure 4.4. If we were able to assign biases explicitly to each decision outcome, then we might be to determine the number of biases inherent to each of the 64 options.

To consider the inherent existence of biases in possible employment process solution combinations, the researcher considered ethnographic stories, i.e., to identify whether some of the 64 options were more or less prone to bias in reality. Thus, the 64 options were tested against the 77 biased, i.e., if ethnographic scenarios could be found to show whether or not the biased existed; and placed in an Excel file in a binary format (see figure 4.4 or 4.6 as a sample).

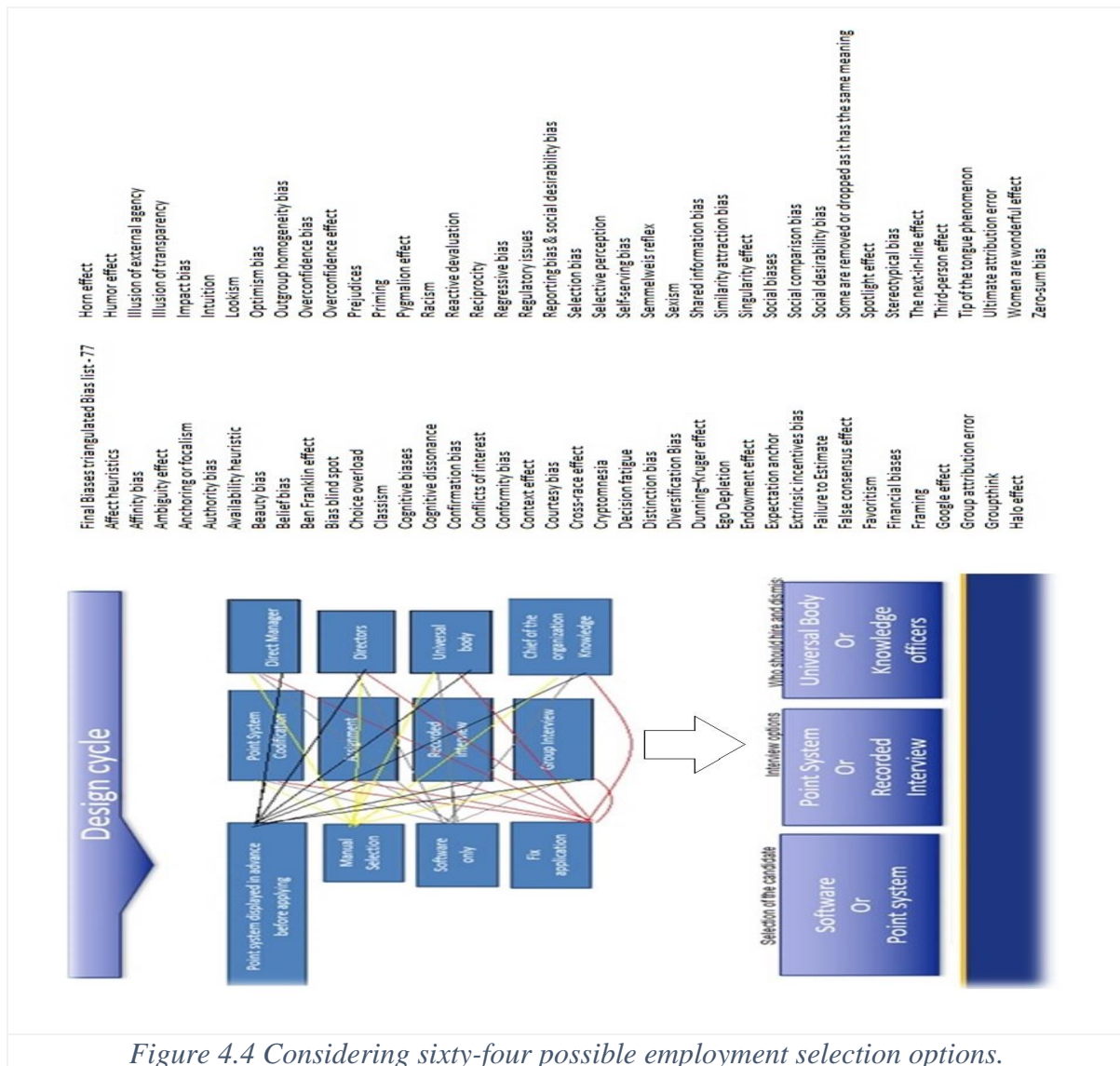


Figure 4.4 Considering sixty-four possible employment selection options.

After analysing the ethnographic stories against selection choice outcomes, it was found that although biases were identified in some stories (see Appendix D), the allocation of biases was not always consistent in the involvement of different people's experiences. The number of biases was relatively low in situations where good practice was followed, and bias subjectivity was controlled.

In conditions where the biases and subjectivity were not controlled, the number, impact, and type of bias varied considerably. Bias in the employment selection process is inconsistent, so completing an explicit mapping is **practically impossible**.

The mentioned test, which is a repetitive approach to examining the bias in each scenario, was able, however, to inform the study which stages are most safe, where the loop should be placed, and where an open-loop controller should be used, i.e. because the open-loop controller identifies subjective human decision points. The data were input into Excel, where a three-dimension loop was created to test



the 64 options against the 72 biases. This step is achieved by placing "bias removed" or "still exist" in the Excel file and then using an Excel equation to calculate the least biased option (see Figure 4.6).

An additional complication relates to the fact that some combinations of options were more common than others due to social practice multiple exemplars, and Ethnographic stories was not available for all of the 64 combinations (see figure 4.11) – making a critical comparison against the bias list impossible. For example, although participants stated that recording interviews were a desirable option, very few participants had experienced this in practice, making it hard to find stories that used this combination. As such, although for governance reasons, the researcher can see a considerable benefit to recording interviews, we cannot explicitly determine whether recording interviews would reduce bias in all contexts.

The variation in the bias experiences of our participants (even in the same selection combination) means that developing an explicit set of guidelines to manage and control biases is complex. By considering available stories, i.e., by merging the relevant and Rigor cycles (see figure 4.6), we were able to show that:

- i) Some process options are much less common in practice than others,
- ii) When applied, some options (based on available stories) have much less chance of creating biases.

Interestingly, the most common use processes do not align well with best practice, i.e., maximum removal of biases. Techniques and methods used most commonly in the employment selection processes, for example, CV and interviews, reflect the historical practices that aim to simplify (with a short-term perspective) the hiring workload for the employer but are arguably open to **subjectivity** and bias. Within the ‘selection of the candidate’, we identified that software- or points-based systems are much less likely to be biased than manual or fixed application selection options.

It makes sense that using specifically developed formalised systems, such as a points-based system, which requires the employer to define the criteria in advance objectively, should be less biased than a manual-based process. Moreover, a fixed application, which is not specifically developed to reflect the specific requirements of a particular role, was also seen as being negative – due to the overly generic nature of such processes.

Within the ‘candidate selection’ stage, it was identified that a points-based system and recorded interviews appear to reduce the chance of bias. The need to predefine the points criteria and the weighting of points based on the criteria significance; therefore, using a points-based system, the assessment of any applicant is based purely on the fixed scoring practice. As such, issues such as gender/age/appearance/background become irrelevant since they are (if not defined in the agreed criteria) not impactful on the final decision.

[illegible]

Figure 4.5 Sample of the testing with 77 biases.

The reduction in bias, i.e., because of the recording of interviews, is also interesting since it shows that stakeholders appear clearly aware (consciously or unconsciously) that evidence is being collected, and as such, there is a more significant chance that biased behaviour will be checked and disciplined.

The number of stories involving recorded interviews was quite limited; however, the variation identified as a result suggests that most individuals are aware of the biasing policy, but that policy is not always consistently or rigidly enforced, mainly if no records or recordings are kept; and the context of the application and the company culture influence bias variation.

Selection of decision-makers revealed that the lowest amount of bias occurred when either a universal body (for example, someone from human resources) or an independent knowledge officer (for example, a person who is familiar with the knowledge and skills required for the position) made a final decision based on predefined criteria.

The knowledge officer's suggestion could also have biases and prejudice; a criterion for selection must be defined in advance to allow the independent universal body or knowledge officer to distinguish between candidates.

A candidate (at an interview) might appear impressive, but if they fail to meet the predefined criteria, giving the person the job would be wrong – and, more importantly, hard to justify. The existence of pre-defined criteria and the allocation of the decision to someone who is not 'going to have to work with that person' removes the chance of bias (positively or negatively) impacting the result based on personal and characteristic preference. Where a role requires complex awareness of the topic (i.e., the existence of specific knowledge and skills), then selection should be based on the candidate possessing the knowledge criteria, i.e., things that the individual needs to know to undertake the role effectively. In such situations, selection by a non-expert would result in the decision being based on other less critical, opening the door to considerable bias. Hence, to minimise bias, considerable thought must be made by the employing organisation in advance of the interview and selection process to fully understand what is required in the advertised role and what knowledge is essential to facilitate a systematic selection process. The definition of this criterion in advance of the interview commencing ensures that all interviews have a similar set of questions and that the appearance and manner of the individual, if not central to the criteria of the role, is not subjectively impacting the selection decision. Thus, in the current research, a "satisficing" outcome was not reached – as the outcome cannot mitigate biases in the employment selection process (Hevner, 2004).

The design cycle within this chapter highlighted several employment selection options that, if applied effectively, would support the reduction of biases; however, no specific prescriptive design was developed to support the management of biases in practice. As such, the design outcome does not fulfil the stakeholder "satisficing" status. Accordingly, the researcher must return to the literature to include another component that could help mitigate subjectivity based on Hevner et al. (2004). thus, the new

components will be discussed in the next iteration. So, a second iteration is needed when the first cycle does not provide a satisfactory outcome.

To sum up this stage, the wisdom of crowd theory demonstrated by the Relevance Cycle and the testing parameter established by the ethnographic methods did not fully help the design stage to develop an artefact because the wisdom of crowd theory did not suggest enough solutions and missed detail concerning subject expert, in addition to high subjectivity in the domain of decision making. Therefore, the next chapter is a second design science cycle that aims to consider all parameters using other methods in the Relevance Cycle.

### 4.9.3 Conclusion

The study in Chapter 4 demonstrates one completed cycle for design science with several contributions, even though the study failed to develop a system as a solution or artefact. Since the research aimed to develop a satisfying solution, we conclude that another design science cycle is needed to develop the system artefact.

The study failed to develop this system or the artefact where the target solution proposed by the Relevance Cycle through data collection. The Relevance Cycle was harvesting people's knowledge and proposing the system according to the people's knowledge. The proposed solution develops after collecting people's experiences on what they think is the right approach to mitigate biases they witness in their job search, see Figure 4.1. So the Relevance Cycle collected people's experience of bias in employment selection. However, when testing the developed process suggested by people according to what they have witnessed with the parameter collected from the ringer cycle (77 bias), see Figure 4.5. The study found high ambiguity and subjectivity; this means the study did not reach the satisfaction stage. Therefore, the decision to conduct another cycle was deemed necessary due to high subjectivity when testing the proposed solution from the Relevance Cycle with the 77 bias developed in the rigour cycle. Thus, the Rigour cycle was the parameter employed to add rigour to the design. In one year or six months to come, GPT4 with Bing will provide a source of information in this way; it shows if this information is coming for scientific pages or not.

The outcome of the design cycle is the requirement for the second cycle. Since the design cycle concludes that there is a high subjectivity in the domain, the second cycle requires removing the subjectivity in the employment selection system and considering objective parameters as the primary measurement for employment selection. In this way, the control component and the complex loops can manage and control the system; alternatively, it will be tough to control a subjective system.

So, bias examination and data collection that facilitates the preliminary understanding of the control component and the loop location highlighted what causes high subjectivity. Thus, the list below contains the preliminary reasons why subjectivity exists:

- 1- Hiring philosophy, i.e., hiring based on equity or quality, diversified team, harmonic team, et cetera

- 2- A job description that could be designed to match a specific person.
- 3- CV trustworthy.
- 4- Explicit measurement.
- 5- What is the truth, and how should it be measured?
- 6- What is an intelligent candidate, and how is it measured?
- 7- List of issues highlighted in the Environment cycle.
- 8- List of issues that are highlighted in the Relevance Cycle.

The above issues cause high subjectivity in the domain and cause bias to be tested due to different approaches and philosophies, so removing this subjectivity requires an objective system that can be tested easily in a binary approach. Those parameters are the input to the second cycle to re-examine the relevant factors and gain an in-depth understanding of them to remove subjectivity.

The second contribution is the outcome of the Rigor cycle, as seventy-seven biases directly or indirectly impact the employment selection stage (see Appendix C and D). The biases catalogue that impacts employment study (Rigor cycle) is similar to a study concerning bias that affects the medical field shown in the link: “ <https://catalogofbias.org/biases> “. Also, the idea is similar to an implicit project bias study, where several scholars aim to mitigate implicit bias in society. (See the link, “<https://implicit.harvard.edu/implicit/> “). So, “project implicit” aim to mitigate bias from society in contrast to the bias catalogue aims to mitigate bias from medical staff “doctors”, compared to this thesis that aims to mitigate bias in the employment domain. Furthermore, the study highlighted additional biased yet to be studied by psychologists concerning the employment domain.

#### 4.10 Chapter Conclusion

This chapter is the foundation stone for further work as the study identifies that people's suggestions lack rigour; additionally, the study identifies 77 biases that impact the employment selection process and understands the subjectivity in the domain of employment selection.

The future work aims to overcome such issues of subjectivity and benefit from the finding and the knowledge gained from this chapter, including implicit and explicit knowledge.

The second design science iteration includes the Environment and Relevance Cycle (chapter 5), the Knowledge-based and Rigor cycle as an independent chapter (chapter 6), build and development (chapter 7), and evaluation (chapter 8). Finally, and to support an explanation of the developed artefact, a conclusion to the thesis is presented in chapter 9.

## Chapter Five

### Second Iteration

### Environment and Relevance

#### 5.1 Introduction

The contradictory view dilemma remains a complicated issue facing our society; this is the case in the employment selection domain, where managers claim they are hiring the most suitable person, whereas job seekers claim they are biased and have discriminatory action involved. The law rejects discrimination and certain biases in the employment selection domain; however, how can law practitioners assess human behaviour from the legal perspective when high subjectivity is involved?

The first DSR cycle failed to develop an explicit artefact due to high subjectivity in the domain. However, the first cycle created a list of requirements that will be used in this cycle to develop an artefact. This chapter demonstrates Hevner's design science, the Environment, and the Relevance Cycle, intending to identify and reduce subjective parameters without affecting the overall objective by utilizing the most relevant parameters and studying them in the Relevance Cycle. This approach is because removing subjectivity is impossible without understanding those parameters from all aspects: job seekers and managers.

The first iteration discovered high subjectivity in the domain with many parameters confusing to the hiring committee, such as hiring based on equality or equity, diversified or team matching, networking or individualism, hiring based on intelligence, et cetera. According to the hiring committee, all those parameters are unstable and could be interpreted differently.

The study found the most critical factor that could make a difference to the company is knowledge and experience. Therefore, to study the management approach from knowledge and experience and how managers evaluated and understood, assessing knowledge versus experience, the chapter will justify the relevant parameters, define them, and identify the most relevant parameter for use in the design cycle

#### 5.2 The Problem and Chapter Scope

The question being considered in this chapter is - what is the truth when managers claim they are hiring the best candidate? If we accept Michel Foucault's philosophy, i.e., that the person with power holds the truth, then we assume that managers are telling the truth; however, this philosophy ignores the job-seeker's perspective.

Chapter 5 aims to remove subjectivity from the employment selection scope; this goal is fulfilled by considering the subjective environment to limit and codify the subjective factors or the parameter discovered through the study. Therefore, it is essential to understand how scholars codified knowledge as a subjective parameter, one of the most relevant subjective factors. Consequently, understanding managers' position concerning these parameters so that they can be converted to explicit knowledge allows the researcher to utilize the most relevant parameters in the Relevance Cycle. Hence, selecting the candidates in the employment selection process is not repeatable due to subjectivity, yet providing a systematic approach to the codification of knowledge makes the process repeatable, which means more scientific.

This research employs Hevner et al.'s design science. In this chapter, we consider iteration two, Environment and Relevance Cycle, i.e., to identify the subjective environment parameters and reduce them without affecting the overall objectivity of the Relevance Cycle and allowing consideration from both job seeker's and managers' perspectives. Fulfilling this goal by i) reviewing past literature to understand what other scholars suggested in such cases, ii) addressing the most relevant factors, knowledge, and experience, iii) understanding what an intelligent candidate is, and iv) examining managers' behaviour (s) concerning the relevant parameter, in this case, subjectivity in knowledge and experience that is the most relevant factors, and how managers consider knowledge and experience in i) employment domain, ii) work domain, and iii) general observation to several cases spotted through literature study.

In this chapter, the researcher provides an in-depth definition of the most relevant terminologies used in the Relevance Cycle (for example, knowledge and experience - see section 5.4). Second, the researcher presents a completed semistructured interview using an ethnographic format with mid-level managers in a top-down structural organisation (see section 5.7). Third is an observation and analysis of 18 months of real manufacturing data (see section 5.8), examining how decision-makers behave when employing their knowledge and experience in daily decisions. Forth, the author undertook general observation and swift analysis in a randomized location where the process is explicit to the public environment; serendipity was a factor in spotting those cases.

The finding demonstrates that knowledge is the essential factor in the employment domain, and most mid-level managers have a common misinterpretation of the knowledge factor in the employment domain and link knowledge to experience compared to the literature definition that separates knowledge and experience terminologies. Knowledge is the most relevant factor in the environment of the employment domain and has a higher value than experience.

### 5.3 Methodology Review

The methodology employed in this study is the design science research framework by Hevner et al. (2004), which consists of five steps, including three cycles, Environment (considered in chapter 5 section 4), Relevance Cycle (considered in chapter 5 section 5), Knowledge-based (considered in chapter

6 section 2), Rigor cycle (considered in chapter 6 section 5), and development cycle; this includes even development and justifies or build and evaluate.

The research framework guides the design as a problem-solving paradigm, developed by Hevner et al.(2004), where each step or cycle has set rules and guidelines to implement the research. However, within each cycle, researchers can take advantage of the most suitable quantitative or qualitative method to fulfil the study's needs.

Chapter 3 explains the design science research framework in more detail.

## 5.4 The Environment

### 5.4.1 Introduction to the Environment

This study includes the Environment as part of the design science research framework as a problem-solving paradigm to remove subjectivity from the employment selection domain. Hevner et al. (2010) describe the environment as involving people, processes, and technology (PPT) that seeks to improve a specific aspect by employing design science. So, the environment refers to the observed place where the investigated problem lies.

In Chapter 4, the researcher collected people's opinions concerning different hiring stages, identifying where, when, and how bias could happen within the employment selection process. The researcher identified 77 biases that should be used as a testing parameter in the development phase; however, in the development phase, which examines the people's suggestions to eliminate bias in different stages, the researcher could not develop a solution artefact due to high subjectivity in the domain. Accordingly, the outcome of Chapter 4 is considered an input to this second iteration.

Chapter 4 assessed where bias happens, aiming first to understand the preference and second to find the best solution and place for the closed and open loop by repeated testing of each bias. This process developed the awareness that i) bias could start at one point in the employment selection lifecycle yet impact in another (very different) phase - see appendix D; and ii) recommend continual monitoring and elimination of parameters to control bias.

Thus, defining and removing subjective variables facilitates the triggering mechanism and controls the feedback loops to obtain a non-subjective outcome. That means several parameters were highlighted as subjective and required discussion and reduction because the subjective system is impossible to control. Therefore, chapter five requirements heavily depend on chapter four's output and findings. The chapter highlighted several stages where bias could develop further; the human, process, and technology are linked and interact, and the interaction could become a 'bias starter' or 'bias impact' point. The reason is that technology has yet to comprehensively codify the process, leaving the gap open for prejudice or discrimination, this phrase means human knowledge on a CV could be a bias starter, and interpretation of information on a CV could also be a bias starter or impact. The human factor involved in the process could be a point of bias. The adopted hiring philosophy could be a biased point. Humans writing the



job description could be a point of bias. The decision-maker and the selection criteria could become biased. Therefore, this chapter aims to remove the subjectivity in each step, eliminating several biases discovered in Chapter 4.

Below are the main problem points identified:

1. Knowledge and experience authenticity documented in the CV - Chapter 4 data collection highlighted that managers do not trust CVs.
2. The philosophy of hiring, i.e., hiring based on equity or quality; diversified team; harmonic team; et cetera - Chapter 4 highlighted this point at the Environment stage, where the literature review suggested this complication. So, this creates subjectivity in selection.
3. The hiring methods - Chapter 4 discusses this point where many scholars agree that interviews can be, if unmanaged, a biased process; chapter 4 identifies 77 bias impacted this process.
4. Technology: Chapter 4 expresses that technology and AI tools become a point of bias.
5. A job description that could be designed to match a specific person - Chapter 4 data collection highlighted this point explicitly.
6. The CVs selection process for the first screening to identify a potential candidate - This point has been highlighted in Chapter 4 data.
7. The evaluation criteria become a point of bias.
8. Implicit measurement, as chapter four shows, this measurement becomes a point of bias, as shown in data collection.
9. What is the truth, and how has it been measured? This is an axiological question addressed in this chapter due to the contradictory dilemma between managers' and job seekers' perspectives highlighted in Chapter 4.
10. What is an intelligent candidate? A question was raised in casual conversation by managers after the interview.

According to Hevner, the artefact should have “satisficing” elements for the “key stakeholders”; i.e., mitigation of bias is fulfilled, and satisfied job seekers and managers aim to select the best candidate during the design. Chapter 4 reveals different causality and requirements that lead to bias in the ethnographic study. For example, managers do not trust CVs without additional concrete evidence; and job descriptions appear to contain many errors and contradictions, et cetera. Additionally, the ethnographic study of biases shows that bias could develop in a particular stage of the employment selection lifecycle but is reflected in other life cycle stages (see appendix D). So, the system could fail to have stakeholder satisfaction if noticeable bias is left or neglected at any stage.

The last point in this section is that the study does not claim to be able to mitigate 100% of bias, and satisficing status could be lost at any time due to subjectivity or law requirements changes. Therefore, it is wised that the final artefact solution must be continuously checked to identify whether a new requirement or law leads to a need for iterative system improvement.

The study aims to tackle subjective measurements found in Chapter 4 through Relevance, Rigor, and development stages to codify them.

The following sub-sections critically consider a number of specific parameters that, according to Chapter 4, directly impact the hiring process to consider possible suggestions, those parameters as below.

#### 5.4.2 Knowledge and experience authenticity in the CV

This section considers how scholars understand and codify human knowledge to remove subjectivity from the environment. That is the knowledge placed in the CV as documents harvested individual knowledge. Knowledge management is the umbrella for managing, codifying, sharing, enhancing, and explicitly exploiting knowledge. Due to Chapter 4 findings, the researcher believes it is essential to justify the capture, codification, and integration of knowledge in the employment selection domain. The selection of a candidate for employment is one of the organisation's essential processes, controlled and run by Human Resources Management (HRM) (Malinowski et al., 2006). New employees should share, exploit, and contribute to organisational knowledge to accomplish the daily tasks; otherwise, the employee is only doing a specific job, and as soon as this employee vanishes (for any reason), this creates a knowledge gap in the organisation. Still, the surfeit of applications received for some roles makes selecting the best candidate hard. Therefore, Human resources as an employer must consider CV authenticity, knowledge, education, experience, team matching, soft skill, and much more (Phillips, 1991; Wendover, 1991; Cerrito, 2004). Other complications, for example, people's desperation for the job/income/well-being, means managers could face pressure to hire friends and family or a particular person ignoring ethical guidelines. Broadbridge (2004) stated, "It is not what you know, it is whom you know," and this often inappropriately appears to be true. As well the impact of the hiring approach on society is another dimension that has a broader impact on shaping individuals and society. According to Chapin (2009), when a bias in daily activity and decision-making inflames, it suggests knowledge reduction in the environment. Moreover, due to human action and reaction theory (Van Baaren et al., 2004; Bach, 2008; Chartrand and Bargh, 1999), biases and unfairness have a broader impact on society with various consequences. Therefore, a justified mechanism is needed to eliminate all the complications impacting individuals and society.

The literature revealed several studies that integrated Human resources with knowledge management without elaborating on how to integrate the selection process with candidates employing knowledge management. For example, Scholars justify the link between knowledge management and human resources as both domains relate to people.

Several researchers highlighted that recruitment and employment selection, including education and development, performance management, pay, and reward, are all part of knowledge management (Robertson and Hammersley, 2000; Carter and Scarbrough, 2001; Hunter et al., 2002; Evans, 2003; Currie and Kerrin, 2003; Santoro and Usai, 2018, et cetera).

Accordingly, Currie and Kerrin (2003) focused on how traditional recruitment hinders knowledge sharing, a fact echoed by Nonaka and Takeuchi (1995), who stated that the socialization phase is knowledge sharing process and knowledge is not shared in the organisation if no one has the knowledge to share. The socialization phase supports Currie and Kerrin's arguments that an overqualified person should not be avoided because tacit knowledge transfer (i.e., as part of socialization in the organisation) and tacit knowledge sharing support the organisation. Suppose training is required to prepare the candidate, as in the case of an apprenticeship. In that case, the company can agree with the candidate on a time contract so that training resources (time and money) can be invested correctly, for example, in areas that support both the employee and the organisation.

Additionally, scholars argue that HRM should align with Knowledge management and organisation strategies (Hansen et al., 1999; Zupan, 2007; Smith, 2004). It is crucial to remember that Knowledge management is broad terminology, including technology, knowledge codification, Knowledge acquisition, knowledge sharing, et cetera.

The purpose of knowledge codification is to eliminate subjectivity in the hiring process. In this instance, the information on a CV is used to find the best candidate for a job.

The knowledge codification mitigates managers' subjective view of an earlier argument demonstrated in Chapter 4, that "managers do not trust CV."

There are contradictory views concerning CVs when studies consider CV is essential to document compared to managers that do not trust CVs. For example, Woo et al. (2019) started by considering the CV a vital document for the article study field. A curriculum vitae conveys knowledge and background, education levels, and publications (in the case of academics) and often includes a personal statement stating who they are and why they want this role.

Woo et al. (2009) recommend that a CV must be free from spelling mistakes and encourages job seekers that different people should review their CV before using them. Woo et al. also claimed that the CV should tell the employer "who you are." Although "who you are" is not critical to meet the role, it is commonly a section in the CV and job application form. Still, who you are will not help the company develop new knowledge, share knowledge, or codify knowledge as key factors for company prosperity. The CV should reflect the candidate's knowledge in the specialist domain. However, it should also contain relevant knowledge from other disciplines because different areas of knowledge could help improve the dissemination of knowledge via socialization; for example, the shape of a new airplane may be based on the biological shape of underwater species. Accordingly, diversifying knowledge could improve the candidate's specialist knowledge in the area, i.e., taken from socialization with experts in different fields. For example, mechanical knowledge may be suitable for surgeons who face the unknown and improvise with skin and bone reconstruction. In other words, various knowledge helps develop new knowledge when a need exists.

Knowledge and learning preference shape the candidate and inform the employer about the candidate's abilities, irrespective of who the person is, their skin colour, or their ethnicity. Since there are different types of learners, knowledge and education can be claimed to shape the candidate. This shaping is vital to the employer and irrelevant to any other parameters. Examples show that a candidate's ability to demonstrate knowledge is essential to the corporation and the domain. This thesis does not consider the other listed parameters (physical appearance, race, and skin colour) as noise because it has limited value. The argument in Woo et al. study, i.e., i) that the CV should represent "who you are" but also ii) that another person should check spelling and language, highlights an apparent contradiction. Firstly, spelling is related to language; accordingly, unless the language is the critical role requirement, the candidate's knowledge of the role cannot be assessed from spelling. Second, suppose someone has reviewed the CV and systematically checked the content and quality of work. In that case, the CV does not reflect his spelling ability because a third party has been involved in checking the content.

Another contradiction exists in the recommendations of Woo et al., which mentioned: i) the candidate should put everything in the CV, yet Woo stated the second point. ii) two pages are enough, which (in many domains) would be an obstacle – particularly for more participants with a broad scope of knowledge and explicit lists of outputs (such as an academic).

Polanyi stated that "we can know more than we can tell." As such, a two pages limit forces the removal of supporting either or both additional knowledge; and is an obstacle to the job seeker describing everything in the CV.

Jaime (2020) argued that a CV is not a helpful document on its own, which is why employers often request a cover letter, certification, education certification, and much more. The CV role appears confusing, and the value of the CV is limited by its format and scope; therefore, over time, the logical solution for CV development is to switch to an online profile where people can justify all credentials.

The use of third-party online profiles, which the researcher suggests, is a straightforward solution for credential verification. In this way, the candidate only links the profile to a specific company when permission is given, allowing it to be shared securely for X amount of time. The company might connect to the candidate's 'internal annual report' – available to the company for a limited time - allowing the candidate to profile comments available to multiple potential employers. A third-party profile mechanism would encourage iterative and interactive communication between the manager and job seekers. If additional information is required, then the job seeker has the chance to respond. If the job seeker believes the management decision is based on false information, then an opportunity should be given to respond to crucial decision points.

This is the case even post-employment selection, in case of a disagreement between the new employee and management, which leads to the candidate seeking other employment. The third-party could record

selection discussion, selection criteria, and role scope, thus overcoming possible manager subjectivity, bias, and mock bureaucracy.

The suggested approach, however, has two issues: i) CV standardization, using technology to ease the process, and ii) the cost per individual. Additional research is required to investigate how these points impact system adoption.

Braileanu et al. (2020) developed a CV as a rubric for the radiology employment selection process. Braileanu et al. mention that the hiring process is vulnerable to bias and suggest dividing the CV into crucial sections: "work experiences, Education, Leadership, Research, and Teaching. However, Braileanu et al. ignored the consideration of tacit knowledge, which is crucial to the organisation (Nonaka, Takeuchi; 1995, Fernandez et al., 2004); this study also suggested to standardised CV but using different criteria that will be discussed later. Moreover, Braileanu et al. mentioned several biases (for example, favouritism, name bias, and third-party bias). Still, the study suggested no mechanism to mitigate biases, mentioning that using a standardized curriculum vitae is essential.

Naylor (2005) considered the CV to be a critical document requiring continued maintenance and highlighted the misrepresentation of the CV. The single-point online profile system could support a standardized CV and employ the best practice methods, accumulating human knowledge daily. This approach would refute Polanyi's statement, i.e., that "we can know more than we can tell" because the profile approach does help employers appreciate everything the prospective candidates know. This point is a knowledge management contribution because if this approach is fulfilled, it is a breakthrough in knowledge management since humans can reflect knowledge to the employer through accumulative documentation.

The controversial issue, however, is the resource cost involved in adopting and maintaining this online platform-based profile solution, as the use of CVs is inexpensive, and the company benefits from reduced hiring costs. Accordingly, research is needed to examine if either or both people and companies are willing to pay for the additional cost of using a third-party profile solution, assuming that this increases information interchange and reduces the risk of bias in the employment selection.

Teixeira da Silva et al. (2020), when discussing CV issues, cited the Paolo Macchiarini case, where false information was included on a CV and used to secure a job at Karolinska Institute in Sweden (Teixeira da Silva, 2017a). Examples of CV forgery are common and could be used to argue against the use of unvalidated candidate claims, for example:

- 1) The formal director of Massachusetts medical examiner Lise Riccobene falsely claimed to have a master's degree; however, unexplained death led an outside organisation to reveal this fact;
- 2) Marileen Jones, dean of the Massachusetts Institute of Technology, Marileen admitted that she misrepresented her CV twenty years ago when applying to MIT; since then, she has lost the courage to correct it;

3) Leslie Cohen Berlowitz, the prestigious American Academy of Arts and Sciences formal head of Arts and Sciences, resigned because of the untruth doctoral degree from New York University on her CV;

4) John Andrewes claimed he had a medical doctorate, allowing him to become chief at two NHS trusts;

5) Faisal Ahmed, a federal employee, who worked as the director assistant of the Office of Law Enforcement and Security Director, was found to have falsified his BSc degree.

Teixeira da Silva et al. (2020) questioned the validity of CV data without validation; for example, only 11% of publications listed by applicants in a surgical fellowship program could not be verified. However, no in-depth investigation was made to understand whether the CV was intentionally fake (suggesting fraudulent intent by the applicant) or the publication was just inaccessible (due to the local or sensitive nature of some medical publications) (Branco et al., 2012).

Teixeira da Silva et al. (2020) suggested as a solution the use of third-party punishment for candidates who misrepresent themselves in their CVs, considering this approach to be verifiable, accurate, and useful when using a public online CV platform. Although the researcher agrees that CV authenticity is needed and that such a solution would be easier in the context of a third-party profile platform, such consideration is deemed out of the study scope - and is recommended for consideration in further study. The points of disagreement with the Teixeira article is that punishment-based bureaucracy will not work because:

- i) Such a legal approach could easily become subjective (and therefore be misused), and
- ii) The researcher firmly believes that a punishment-based bureaucracy will not work as long as the internal decision-maker ignores the validation and checking processes.

The cases of fake CVs listed above or in Appendix F consolidate this finding, compounded by claims that, in most cases, insiders recommended the candidate. So explicit, clear indications/checks are needed to tell whether candidates provide a verified or unverified CV.

The researcher, however, agrees with Branco that a third party is needed, and although further study is also needed to measure cost and adoption issues for a database platform, the idea will be considered functionally most appropriate. In such a solution, the candidate would be responsible for verifying their CV when submitting evidence through the proposed platforms. When there is manipulation in the CV, the log will show when this manipulation occurs as an indicator for additional verification. The complication lies in who has the power to flag the CV as authentic or non-authentic. Moreover, what are the guidelines? In conclusion, CV knowledge is questionable at best and could be mitigated in future research; however, the information gained will help further study when developing artifacts.

Some contend that a degree or certification means nothing if the applicant is capable of performing the job. This is the same argument in the court case for Jon Andrewes; for example, people who have graduated with a computer science degree could see the training outcome as programmers and coders. However, the program is likely to contain deeper implicit knowledge, like algorithmic thinking and computational thinking, which requires awareness of complex theoretical knowledge. As such, the

degree represents not only a certificate but a validated awareness of both practical and theoretical knowledge and the implicit knowledge inside each program. Spence (1971) showed, using signalling theory, that candidates with a higher level of education had a higher level of ability (especially in complex domains), and those with lower education had a lower ability. Validated CVs can therefore be used to reflect explicit achievement, and while education is expensive, educated candidates should reward their efforts accordingly (Spence, 1973, Streby, 2006).

Accordingly, unstructured, non-validate CV content is inadequate and potentially untrustworthy; thus, CVs that do not focus on knowledge create subjective bias. To counter these issues, Osipovs (2019) developed WEKA (Waikato Environment for Knowledge Analysis), which is software to support CV analysis, allowing staff to flag issues in the CV. Although this becomes a public process, which is good practice, this does open the process to mock bureaucracy and bias, i.e., caused by the flagging of CVs that conflict with managers' personal, physical, and cultural characteristics. Moreover, Visa et al. (2015) utilized the Evolution Helix application to recruit professional candidates at the University with a PhD degree. These examples show that many software solutions aim to automate CV errors; however, there is no mechanism for automated bias elimination, such as a mechanism to flag biases. Moreover, to our knowledge, no studies propose a research framework to expose and remove biases. Hence, the researcher considers all these issues and plans for a bias mitigation system that will employ beneficiary humans and the public as a monitory body to the entire process.

In conclusion, a CV is an essential document; however, if misused, the CV can be a source of bias creation, particularly when managers do not appreciate the knowledge. Also, the software can be used to gain CV feedback; however, if a manager dislikes a candidate, then they might claim that the CV is fake, with limited concrete evidence – thus rejecting a good CV for no good reason. These management behaviours cement the need for future study to understand management behaviours from knowledge and experience.

From the discussion, it seems that a meritocracy system would help to support the removal of biases. The researcher suggests that knowledge codification should start with the hiring company requesting a validated "certification of experience" to evidence the candidate's knowledge when previously employed at work. The researcher believes that such certification, combined with the education created, more accurately demonstrates a picture of the candidate's knowledge to the potential employer.

This approach is arguably more manageable than the third-party validation authority since it would be relatively easy to create documents for each employee's highlighted areas of knowledge. Moreover, if misrepresentation happens, the company providing the 'certification of experience' is arguably partly responsible; thus making them potentially liable for misrepresenting the abilities of the person who issued this certification. As such, the prospective employer should verify the certification and credentials of applicants before short-listing the candidate.

Summarising this argument, explicitly defining knowledge aligns with Nonaka and Takeuchi (1995) and supports a knowledge-creating company; accordingly, this approach will be detailed and discussed later in the Rigor cycle.

Lim et al. (2015) claim that the CV is a failing system highlighting several issues in the employment domain, including: "tedious form filling requirement, unrealistic essential qualifications, lack of human involvement, the unread resumes, the available positions not advertised, and the silent treatment, black hole, and more." Lim et al. collected qualitative data from career writers regards job marketing and summarised several issues (see table 5.1). Furthermore, Lim et al. developed thirteen guidelines for recruitment. The guidelines help this study develop knowledge from past research and compare the thesis approach to create a better system.

*Table 5.1 CV issues -Lim et al. (2005) finding from non-peered reviews articles*

Category	User role	Issue Faced	Potential Solutions
Logistic Issue	Recruiter	Time Limitation Resource Limitation	Build talent pool strategically, for example, creat social media strategy to build community to attract and maintain talents.
Talent Pool Development		Difficulty to find right talent	Collect feedback from the user to re-design the tool
Skill Planning Issue		Lack of Knowledge Candidate's culture fit	Train the recruiter
Strategic Planning Issue		Strategic Challenge Unmatched experience level vs hiring cost	Find the balance between the expectation and the cost; utilise athe tools more effectively
Technology Issue / System		Detailed form filling process	System perspective: only require key information to make the application process easier.
Interaction / Feedback		Disappearing resume Lack of feedback from human recruiters	Engage the job seekers
Technology	Job Seekers	Right talent rejected	Better definition of the criteria
Issue / Recruiter's performance		Matching requirements	
Strategic Planning / Talent Pool Development		Internal hiring	Setup strategy

According to chapter 4, seventy-seven biases were identified that could hinder the process if any of those biases existed. Therefore, it seems almost impossible to eliminate all biases. An explicit open system is required, which considers the beneficiary's role in spotting errors and raises the alarm. Such a system would allow every process and step to be publicly debated and monitored (as required). Thus, anyone who monitors the open process could become a whistle-blower and raise the alarm when a discriminatory practice is spotted or a bias occurs.

This approach is similar to the ITIL framework because any practitioner in the process can raise the alarm and register an issue in the system that the process owner and managers can monitor; also, it is widely used in cyber security due to the high ambiguity in the domain.



### 5.4.3 Hiring an Intelligent Person

Managers normally claim they are hiring the most intelligent person; however, this is arguably subjective. How do we define intelligence? Moreover, what are the criteria of an intelligent person? Chapter 4 demonstrated that this is a subjective argument hard to codify. Flynn (2007) conducted a longitudinal study that defined intelligence and agreed that what makes a difference in intelligence is knowledge. Flynn also lists the parameters that could have an impact on intelligence: focus, environment, mental acuity, habits, attitudes, speed of information processing, and memory affected by retrieval theory (i.e., access to data or information) Flynn (2007, P553-54), however, those have little impact compared to knowledge.

Flynn argued that IQ tests are unfit for use and purpose, and intelligence has little value when solving a problem if context knowledge does not exist. Flynn concluded that knowledge has a higher value compared to other parameters (Flynn 2007) and that knowledge should be considered vital to identifying a contextually intelligent individual.

### 5.4.4 Hiring Philosophy

The hiring philosophy is another subjective management issue that needs to be considered during the mitigation of biases since some managers focus on prioritizing team fitness, team matching, or cultural fitness (Edvardsson, 2008) as part of the hiring philosophy. The literature on hiring philosophy is divided. Some assume that the applicant's culture should fit the team and that there must be a universal team ideology. Others claim that diversity in a group has advantages and disadvantages (Brelade and Harman, 2001). Interestingly most scholars now agree that

1. Hiring just to achieve organisational cultural fit results in long-term unproductivity since this approach eliminates the organisation's ability to incorporate broader and diversified thinking (Brelade and Harman, 2001).
2. An organisation's culture is not fixed yet linked to people within the organisation; the second point is controversial in large and culturally diverse companies, resulting in managers separating organisational culture from team culture, despite scholars linking team culture with organisational culture and fitness. Thus, the company changes if the team and organisation culture change. Therefore, explicit consideration of explicit codified knowledge provides a neutral approach to ensuring that hiring philosophies, team culture, and organisation culture are not used as subjective (biased) reasons for candidate rejection. Fernandez et al. demonstrated that knowledge-intensive companies worldwide are valued at three to eight times their financial capital, and peoples are part of this knowledge. Accordingly, the acquisition of knowledge is what matters to the organisation. (Fernandez, Gonzalex, and Sabherwal, 2004).

The question is how to codify knowledge outside the organisation ( knowledge list in CV) and remove subjectivity – especially when knowledge is subjective or tacit in nature.

The role and responsibility matrix, termed the RACI matrix, is one of the primary components of the ITIL framework that has been used and tested with a successful outcome. The RACI matrix is a responsibility chart that maps out every task, milestone or critical decision point involved in completing a project and assigns which roles are Responsible for each action item, which personnel are Accountable, and, where appropriate, who needs to be Consulted or Informed. As such, the RACI matrix can define the key responsibilities, skills, and knowledge required for a specific role. Although the prospective candidate should be informed about the explicitly accepted core (baseline) company ethics, principles and cultures, the RACI matrix should define the role. Thus, to become employed at a specific company, the candidate must accept the organisational baseline norms, thus removing the need to undertake team matching.

The employment selection decision, therefore, depends on the

- i) Role and responsibility matrix.
- ii) The candidate's acceptance of the company's baseline, philosophy, culture, ethics, and principles.

This approach also removes the subjectivity from contradicting the hiring philosophies and other soft skills that are impossible to codify and quantify. The key point is that the candidate must be informed, accept the company's soft skills, and adapt accordingly. At this stage, the subjectivity of the hiring philosophy is mitigated by considering the main parameters that make a difference in the job, i.e., knowledge and experience (within the role and responsibility matrix).

The question remains, however, of how to eliminate selection based on subjective knowledge and experience.

#### 5.4.5 Consideration of Technology in the selection of the candidate.

Several scholars aim to codify the employment selection process using technology solutions. This codification focuses on the CV usually fulfilled by using XML-based analysis and other technology to create a new application that explicitly scores aspects of the CV, for example, E-Gen software (Kessler et al., 2007).

The difficulty of explicit CV codification is the score ontology (what categories of knowledge exist for people to know about) and score epistemology (how a score is created and what is possible to learn from that score), not the programming.

This is especially true for technical scholars who lack knowledge in management science and tend to focus on solving the technological complexities of importing CV content. In comparison, knowledge management, i.e., as a science, manages human knowledge and employs several methods inside corporations to utilise human knowledge in order to maximise operational performance and knowledge creation (Nonaka and Takeuchi, 1995; Davenport and Laurence, 2000). Both are needed to improve the hiring domain. Consequently, employing knowledge management methods and later employing technology to facilitate the methods is missing in research that largely focuses on adopting technology.

Therefore, the codification of knowledge directs us to knowledge management science; with automation, the outcome of appreciating knowledge codification.

Such methodologies are needed to improve the hiring domain and society. So, employing knowledge management methods, assessing them, and later employing technology to facilitate them is missing in those articles because the focus was on adopting the technology.

Consequently, the codification of knowledge directs us to knowledge management science. In the same vein, automation is an outcome of knowledge codification that draws the author's attention to Ikujiro Nonaka, Michael Polanyi and Hirotaka Takeuchi, the fathers of knowledge management.

Accordingly, the chapter investigated the following:

**First**, justification of Knowledge management in the employment domain.

**Second**, the codification for candidate selection or the automation of candidate selection is fulfilled by codifying knowledge, which is also done by reviewing the literature to find the most suitable knowledge codification method.

The codification method could be software or philosophy or methods, or a combination of them.

**Third**, the hiring philosophy and how to remove subjectivity from several hiring philosophies contradict each other.

**Forth**, the selection methods and how to remove human bias, dropping their seeds or bias action in a specific phase and the impact of the bias happened in a different phase. Remember that participants are oblivious to this bias; this case is according to the data, observation, and literature review demonstrated in the ethnography methods and the previous chapter. So, the point system's involvement that people suggested also helps eliminate bias in the section.

**Fifth**, The mechanism needs to check whether the job description errors are intentional or unintentional. Appendix G shows three examples of job description errors. At this stage, the study only focused on knowledge errors, as demonstrated in the three examples; other errors or biases could be eliminated in the different approaches that will be suggested in the several stages. Scholars address this issue as an imaginary requirement. This means contradictory knowledge that does not work with each other, as explained in detail in the example; however, no one can employ PRINCE2 project management and PMP at the same time. Alternatively, the knowledge requirement is not clear and contradictory, as shown and critiqued in example one. For example, the job requires ITIL and Agile to be both business processes, and using both lead to distraction because one is flexible the other are restricted. Such errors will be fixed at this stage.

The information gained from the data in ethnographic methods informed the author that several biases are embedded in the job description; therefore, the wisdom is to employ methods that criticise the job to meet perfection. This criticism also matches the Nonaka approach to knowledge creation because this interaction drives the final document to perfection. Also, this study is pragmatics in nature, which considers people's acceptance of the job description when no complaint registered regarding the job is subjectivity elimination; so, complaint means subjectivity.

**Sixth**, the monitoring system during the interview stage could highlight several issues and biases; if no issue is registered, the interview works fine according to the pragmatics philosophy.

Although specific points were tackled already in the past chapter through the survey, humans suggested technology engagement to eliminate bias. However, the author concludes that no software can fully automate the process while reviewing several software applications like the Evolute Helix application, E-Gen, Zoho, Waikato Environment for Knowledge Analysis, et cetera. Hence, human involvement is a must where bias could happen.

Following Hevner's DS framework, the complexity listed above was studied meticulously through the literature review.

The author agreed with the vast literature that the solution lies with knowledge as a meritocracy system that is critical in removing most subjectivity and eventually removing most biases. The codification of knowledge is the second problem that needs to be discussed as part of the solution. However, before doing this, a study is needed to understand how managers understand the knowledge and experience in the employment domain; understanding management behaviour facilitated the knowledge codification and the control component for the loop because managers are the control component for the loop. Thus, this will be tracked in further research.

According to people's suggestions in the past chapter, the point system is another mechanism to overcome bias. The proposed system is an active system involving all stakeholders, whereas the current system is a passive system with Job requirements detailed in the job advertisement by decision-makers if it is the right or wrong requirement with bias checking mechanisms. The candidate selected is opinionated, if bias is employed or not, without monitoring mechanisms; in fact, an authoritarian system and power in the hand of whoever has it. The current hiring process is a passive system in a state of chaos; each person sees it differently. The employed person comments that the system is a perfect system, whereas the unemployed see the system as bias system. So, the author of this thesis develops an order system from this chaos employing several mechanisms and methods to control the environment so that everyone can see the meritocracy system. Also, according to the survey, the majority agreed that the principle of knowledge and fairness is the only mechanism in specific roles. The proposed mechanisms described in detail to create order are validated and checked by the open and close loop adapted from Nonaka and Takeuchi's (1995) framework for knowledge creation, as chaos could be the source of knowledge-creating.

So before delving into detail at this stage, the study proposed two mechanisms to mitigate two issues so far: hiring philosophy second is the solution for technology by employing the loop.

The author is concerned about how to convince managers and discuss the new artefact with decision-makers, convincing them that the proposed system is a best practice in hiring, reflecting that knowledge is the primary key when considering prospective candidates, in contrast to several other factors. For example, soft skills, fitness, diversification, characteristic match, and other opinionated factors are impossible to assess because they are not fixed and are subject to change. However, those factors should

be accepted and adopted, not assessed. The soft skills assessment is subjective and opinionated. So, based on this concern and the other mentioned reasons, it becomes crucial to understand managers' positions from the knowledge perspective.

The thesis considers employing knowledge a crucial step for the company, and every employee could contribute to the company's knowledge (Nonaka, Takeuchi, 1995, P151). However, ethnography study demonstrates a bias when rejecting candidates due to a lack of soft skills and ignoring candidate knowledge.

The other point concerning this cycle is communicating the artefact that aligns with the design science when considering Hevner DS guidelines. So, after the literature review, the author conducts a study to assess managers' position and understanding of the word knowledge and experience, which is fulfilled in the Relevance Cycle. The reason is, through observation, data collection and investigation, the author spots inconsistency in the hiring process concerning knowledge and experience. The case is clearly expressed in the "Indeed job description and applying requirement". The Indeed job site is advertising its domain as the number one job site, with over 250 million visitors.

The hiring requirement will not allow the candidate to apply for the role without stating you had met X amount of years in the Y role. So the case in "indeed job" is that the decision-maker focused on years of employment rather than knowledge. Scholars address this point that experience should count by the number of tasks, not years (Wang et al., 2017).

The literature review did not demonstrate a clear and straightforward answer to assessing managers' acceptance and understanding of knowledge and experience. This question was crucial to comprehend, Hevner, Chatterjee (2010) P42, because the new artefact required communication with the stakeholder, so understanding the managers' position helped communication in this study from several points.

1. Managers are the system's recipients, so understanding their position from this terminology is essential in delivering the system.
2. Understanding how managers employ knowledge and experience in their day-to-day activities could help the researcher.
3. The managers are the control component for the open loop, so understanding the manager helps us to decide the open-loop position and function.
4. Knowledge and experience are the main points in job hiring in the ideal environment and system.
5. Knowledge and experience remove subjectivity from the hiring system when employing knowledge codification. This leads to an objective system that is easy to control via loops.

Second, managers' approaches to employing their knowledge in the domain and their knowledge and management to maximise the corporation's benefit. So the study involves managers in an interview and asking direct questions, then observing the manager's approach in the work domain to cement the finding.

This study related to roles that are required knowledge as human knowledge is the company's asset, bearing in mind that there are two kinds of roles.

- The first role depends on knowledge to achieve an outcome, so the thesis discusses these roles in-depth.
- The second kind of role requires prestige and socialisation, which is out of the study's scope.

Prestige roles were first considered by Hauser and Warrant (1996), and there are several definitions regards such roles; in most cases, it depends on social class and family income (Treiman 1977). This kind of role is not in the study scope; however, according to Harris Interactive, the list of prestige roles changes over time and the meaning among a nationwide sample of 1,010 US adults. However, In 196 BCE, the Chinese emperor, Kao-Tsu, allowed people with less prestige to compete with high-prestige people in role selection through the examination system, which led to civil service recruitment.

This action explicitly considered a meritocracy system by codifying the selection process and eliminating commoners and nobility from the equation (Franke, 1960). This example is not an invitation to codify all roles; however, the author demonstrates that codification has a deep root in society and history. It also explains that even a stratified society could consider a meritocracy system. This thesis discusses roles requiring knowledge to achieve an outcome because human knowledge is considered one of the organisation's assets. Positively harvesting knowledge impacts corporations and their outcome (Nonaka, Takeuchi 1995). The second role (i.e., prestige and socialisation) is easy to recruit since it depends on connections justified by relation, prestige, look, and assets, which lie outside the thesis scope.

#### 5.4.6 Summarising the Environment

The above section exegesis several factors; employing them all leads to the fact that developing an objective system is impossible. However, one factor is so essential to the domain, and it is the only essential factor in the meritocracy system, which is knowledge and experience; therefore, the next section aims to understand those parameters in more depth and examine management behaviours from those parameters. This enables the study to understand managers, so solution development becomes possible; bear in mind that this study is design science as a problem-solving paradigm.

Therefore, it is essential to discuss the literature and methods to understand the knowledge and experience from manager perspectives because they are the control component of loops methods that will be employed in the design phase.

#### **The summary and findings from the literature**

As stated above, there is a lack of fundamental intervention in the process of employment selection, considering knowledge and experience as the main principle in the process. Managers argue that soft skill, which is tacit knowledge, is essential for hiring and emphasise that the interview technique is an excellent way to understand the individual soft skill. However, scholars reveal several biases in the

interview process, which are considered negative. Additionally, there is a division between the scholars concerning employment selection. This is because several studies argue that diversification is a healthy sign for the organisation, for example, Brelade and Harman (2011). In contrast, others argue team matching stereotype is more productive for the corporation (Kase, Zupan 2007).

There are numerous human diversifications and ideologies in the current era, for example, Religions, Race, Social, Anarchism, Aristocracy, Nihilism, Fanaticism, Capitalism, Communism, Conservatism, Democracy, Oligarchy, Populism, Socialism, Totalitarianism, Authoritarianism, Trotskyism, Fraternity, Hierarchy, et cetera.

The list of beliefs, practices, principles, and understanding directly impacts human behaviour and mentality, considering it is embedded and tacit. Occasionally, based on people's culture, family-raising values, et cetera. The people with such a mentality are unaware of their beliefs, but Leaders reflect this principle explicitly on others (Amanchukwu1 et al. 2015; Dair 2013). According to the Personality-Group perspective, Georgakakis, Greve, and Ruigrok (2018), or similar personalities, it will be hard to match such diversification; additionally, some are hidden and embedded. On the contrary, biases, complications and law issues interfere with such perspective. Therefore, matching an individual with organisational culture and understanding the candidate's soft skills, which are tacit knowledge, uncodified knowledge, and untested or verified, is not a scientific approach and is biased according to the literature. Still, lots of individuals can fake this behaviour or change the principle in the middle of the process (Gaertner & Dovidio, 2005).

A study shows rejection of an immigrant from fanatic managers claiming deficiencies in soft skills, inability to communicate, and lack of work commitment as a proxy for applicants (Moss and Tilly, 2002). So, the researcher demonstrates that the interview is a mechanism to find a match in human characteristics. This process has lots of illegal and biased gaps; moreover, Delta Airlines found that they investigated how the organisation evaluates the new prospective hire in-depth. They conclude that "there is absolutely no correlation between how you interview and how well you perform on the job", Besides, they determine the hiring based on characteristic match (bias) (Yei-Fang Lin.,2002). This example demonstrates that the current system is a failing system.

The interview is a failing technique with many gaps and biases (Perry & Kleiner, 2002). The author is contemplating American Express modifying the employment selection process by dividing the interview process into three stages. So, each stage has several tasks; the final stage is one day interview that includes other socialisation activities. The American Express modification in the employment selection process aims to achieve the best outcome in the selection process. However, American Express asks a third party to recruit people, and this is a gap in the system if the recruiter has a hidden agenda. Still, the recruiter could influence the decision and manipulate the company.

Suppose the recruiter employs an anchoring-effect bias: verbally providing wrong information to two candidates and sending four candidates. Two of them are looking for a software project management role, while the company is hiring for a software development role. In this way, the recruiter imposes the other two candidates in the company. Otherwise, the company has to postpone hiring and demand more people. Hence, the company managers should explicitly ensure that the candidate knows all the details and signs on these details, including the job description, before interviewing the candidates. Data collection demonstrates that three out of fifty entries stated that recruiters sent them to interview without a job description. So, the recruiter and manager could influence the process and configure the department according to a hidden agenda or belief. (Lieber, 2009), (Reinhardt et al., 2013), (Yei-Fang Lin, 2002).

To sum up, this hiring process, which is essential to the organisation, has been left without fundamental consideration of all process aspects, meticulously calculating the candidate's knowledge and experience, which are the most relevant factors in the employment selection domain. Fernandez demonstrates that knowledge-intensive companies worldwide are valued at three to eight times their financial capital, and peoples are part of this knowledge. Furthermore, knowledge is what matters to the organisation. (Fernandez, Gonzalez, Sabherwal, 2004).

At this stage, the study justified the parameter that required elimination in employment selection related to the environment and emphasized the parameters that required better understanding and further study. So, the next step Relevance Cycle aims to understand the management position from the essential parameters: knowledge and experience.

## 5.5 The Relevance Cycle

### 5.5.1 Introduction to the Relevance Cycle

This section represents the Relevance Cycle in design science (iteration two). The Relevance Cycle aims to i) assess (middle management's perspective on knowledge) because managers are the control component in the open loop (i.e., the decision maker) and ii) evaluate managers' understanding of knowledge and experience.

The Relevance Cycle consists of four sections.

The first section (see section 5.5.2) aims to understand the literature regarding knowledge and experience terminologies. The second section (see section 5.5.3) aims to consider the method used to understand and examine what mid-level managers believe is the difference between knowledge and experience. Data collection will also consider how managers interact with and assess new candidates from the perspective of knowledge and experience.

This assessment helps the researcher understand how to address the critical points and deliver the artifact to managers, thus, understanding that the surrounding environment is a pivotal point when



delivering and communicating the new artifact. The third section (see section 5.5.4) observes mid-level managers in order to assess how managers perceive and employ knowledge and experience in the work environment.

There are several biases potentially impact experience, for example, blind spot, hindsight bias, an illusion of control, anchoring effect, egocentric bias, et cetera. Therefore, awareness of bias management and its impacts on management when forming a decision is critical; to ensure that the outcome is based on the employment of knowledge and is not biased. A Department of Education survey (conducted in 2019) concluded that over 1.25 million employees are not fully-adequately qualified (Winterbotham et al., 2019); however, many certified people are unemployed. The question at this point is: Are managers capable of understanding and evaluating the prospective candidate's knowledge, or are they biased in assessing the candidate? In the fourth section (see section 5.5.5), the researcher determines that a mathematical calculation/scoring approach is needed to assess prospective candidates, i.e., because mid-level managers do not fully appreciate knowledge. The use of a pre-defined mathematical calculation helps to remove subjectivity and therefore ease the decision process.

This finding is in line with those ethnographic stories (presented in chapter 4) suggested that a points-based system is needed since managers believe that only knowledgeable workers contribute to knowledge use and creation in an organisation, unfortunately, often treat employees as robots doing a task, not knowledge sources driving collaboration and socialisation. Also, Nonaka, and Takeuchi (1995, P226), cemented the above finding because Western managers believe only a few contribute to knowledge, not every employee. So, managers consider those employees robots doing a task, not knowledge collaboration and sharing sources. So, it seems some managers lack the understanding of the essentialities and cruciality of employment selection step on company performance.

Thus, the summary is as follows: The study has three sections first, define the terminology; second, question managers to understand their position and understanding concerning knowledge and experience; third, observe management at work concerning knowledge and experience, so the outcome is not only based on anecdotal evidence.

This process served multiple purposes besides assessing manager understanding and process fairness; it also eases the delivery planning for a new artefact concerning communication with managers because understanding managers' knowledge eases the delivery of the novel artefact. Hevner also illustrated this point, a pioneer in design science, at Chase Conference 2016 (youtube conference), with an open university in Israel. Hevner stated, "Lots of brilliant design never seen the light because of lack of understanding from the end-user". Therefore, Hevner considers that artefact communication is one of the main principles in design science to communicate the artefact effectively.

### 5.5.2 Definition of Knowledge and Experience, then linking it to CV

A plethora of studies demonstrate that experience is a critical factor in the job selection process, which considerably impacts the selection of the candidate; yet, the word experience is often employed incorrectly and misunderstood. Such a misinterpretation of terms degrades company knowledge as practical experience could be positive or negative. The level of misunderstanding is that Indeed Job search, which described itself as the first job site globally, with over 250 million visitors every month, reflecting societal influence, rejects applicants as preliminary filtration if the candidate puts the wrong number of years in the experience section.

A key question is: what is Experience?

The question, what is Experience: The English word "experience" which originally "empeiria" in Greek. The term refers to human sensory. The experience has two forms, either perceptual or non-perceptual. The Perceptual experience is the experience of physical objects, whereas the non-perceptual experience is otherwise (Plato on Knowledge in the Theaetetus). Experience is a practical contact with and observation of facts or events, alternatively, an event or occurrence that leaves an impression on someone, positive or negative. Otherwise, the experience could lead to different interpretations and knowledge according to the observer. Experience, sometimes linked to knowledge, the experience can be classified into three distinct categories, Associational (black box), motor skills and theoretical (deep) expertise (Kecheng Liu and Weizi Li, 2014). According to Democritus, the experience could be a source of empirical knowledge and measured in terms of the cumulative number of task performances.

When considering knowledge, Aristotle distinguished universal and theoretical knowledge (epistèmè), instrumental knowledge (context-specific and practises related), and ethical knowledge (phronesis).

Knowledge is divided by the OECD (1996) into four categories; i.e., Know-What, which refers to knowledge about facts; know-why, similar to epistèmè (i.e., universal and theoretical knowledge), which refers to scientific knowledge; know-how (termed technè) which refers to skills or capability, and know who, which relates to information about who knows what and who knows how to do what. Experience is arguably the awareness of doing. Polanyi argued that scientific activities always involve both know-how and know-why.

According to Nonaka, Knowing is a form of experience, which can be "bastard kind belong to the following: sight, hearing, smell, taste, touch. However, the knowledge is genuine and far removed from the bastard kind". So, knowledge as "a justified true belief" is classified as tacit and explicit and categorised as subjective or objective (Waterfield, 2000, Nonaka, Takeuchi, 1995). Subjective knowledge represents a state of mind or practice, whereas objective knowledge represents an object, access to information and capability. However, Wiig, Wiig (1999) defined knowledge as fundamentally different from data and information. Knowledge is characterised as Declarative, meaning "know what," and procedural knowledge, meaning "know-how". Both can be explicit or tacit and generalised, contextually

specific or technically specific. Tsoukas (1996) defined knowledge as "inherently indeterminate and continually emerging". In contrast, experience, or "knowing, " is based on Polanyi, So experience knows the way, irrelevant whether it is the best way.

Irma Becerra (2004) described knowledge as two: simple knowledge focuses on one basic area, and Complex-Knowledge focuses on multiple distinct areas; Knowledge is a fact, information, and skills acquired through experience or education; also, theoretical or practical understanding of a subject. Knowledge is awareness or familiarity gained by experience of a fact or situation; knowledge is generated in three approaches: Realist. Second, Phenomenological and Third, Social constructionist. Whereas other scholars concern with education and argue that knowledge should be characterised as "Codifiability and teachability". "Codifiability" means knowledge can be articulated or codified, even if the resulting outcome is hard to impart to another individual. In contrast, teachability is the scope of taught knowledge through training and apprenticeship (Zander and Kogut, 1992).

In business, Conroy and Soltan (1998) categorised business knowledge as an organisation knowledge-based, project management knowledge base, and project-specific knowledge. The three categorisations required a system to reserve, share, transfer, and more; this system is called knowledge management, which became the heart of the organisation framework. Hence, GMI Market Research (2013) defined Knowledge management as "a system that affords control, dissemination, and usage of information; this is often a net-enabled corporate initiative".

To systematically consider the creation and use of knowledge, Nonaka and Takeuchi (1995) developed their book, entitled 'The knowledge creation company', which critically described and decomposed the success of Japanese companies in the 1980s. The book influent company and directors worldwide and encourages many executives to take the trip to Japan as a pilgrimage to learn the success story.

The SECI categorised the cycle of knowledge as socialisation, externalisation, internalisation and combination, which is the cycle between tacit knowledge to explicit and vice versa (Nonaka 1995). The tacit knowledge is embedded in the human mind. Also, highly tacit knowledge is harder to codify, whereas explicit is codifiable knowledge (see figure 5.1). The tacit knowledge becomes the key to the speedy technological and economic environment changes that make organisational knowledge the only sustainable source of competitive advantage (Horvath, 2000). This is because tacit knowledge forms the basis of organisational knowledge that resides and is embedded in employees' minds. Thus, tacit knowledge is regarded as a critical link to achieving innovation success within a firm (Seidler-de Alwis & Hartmann, 2008).

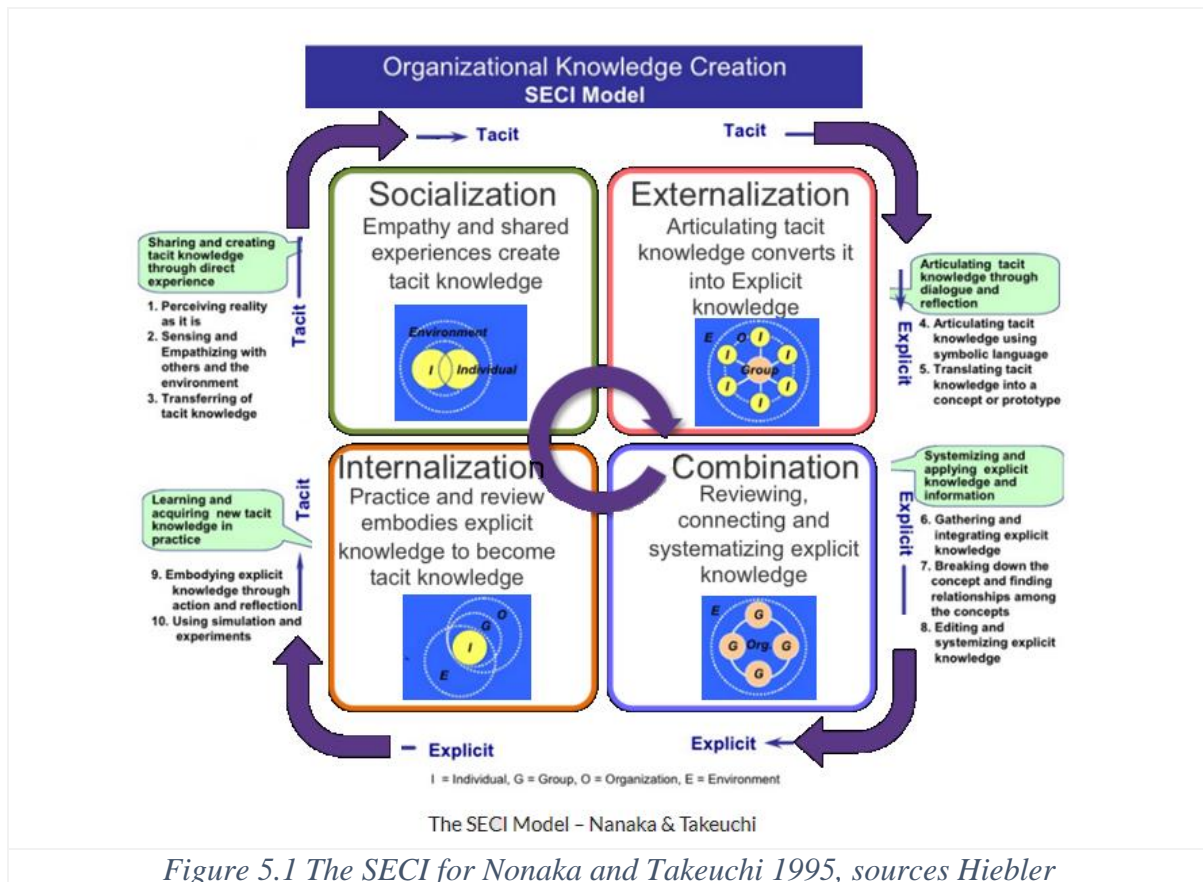


Figure 5.1 The SECI for Nonaka and Takeuchi 1995, sources Hiebler

Although some scholars state that tacit knowledge is impossible to codify for example (Cowan et al., 2000; Saviotti, 1998; Leonard and Sensiper, 1998; Szulanski, 1996), However, Nonaka and Takeuchi stated that a knower might find it hard to codify tacit knowledge; nevertheless, tacit knowledge can be easily codified when employing technology or specialists to interpret the action scientifically. In Nonaka and Takeuchi's book, the authors expanded on Michael Polanyi's work regarding tacit knowledge and proposed the SECI model (see figure 5.1). The misconception arises from Polanyi and Nonaka's expansion and demonstration that the knower found it hard to codify tacit knowledge. Nonaka provides an example of a worker hammering a nail, and it is impossible for him to accurately explain how the worker managed to hammer the nail accurately in one stroke.

To sum up this point, tacit knowledge is not challenging to codify, but it is challenging to the knower; furthermore, considering Polanyi (1958) and his famous speech, "human knows more what can tell", that is correct. However, when employing digital media like LinkedIn or databases, a "Human can tell what he knows". This is because the information is accumulated in this database, so such tools as LinkedIn can put everything they know, including exams, projects, employment, hobbies, et cetera. So the reader can tell what this human knows. Also, to avoid subjective interpretation of this database, the employment process should base on a mathematical equation with an explicit variable to measure knowledge and experience in such a database.

This process is money-saving because the statistics and literature review show that many people are pushed out of a job due to wrong hiring, mismatched knowledge, et cetera. So, the author is working on a solution employing a design science research framework to overcome such problems and the biases associated with such practices.

Back to Nonaka and Takeuchi (see figure 5.2) demonstrated that socialisation lies in people's engagement and interaction. Accordingly, socialisation involves sharing tacit knowledge through mentoring (sharing internal knowledge, skills and insights). Tacit knowledge can be socialised by mentoring, imitation, observation, and practice, resulting in knowledge sharing. Externalisation is when this interaction articulates a problem, converts the knowledge to a process, and later shares it through documentation to solve a future problem. In this phase, the information becomes knowledge that has been converted from it implicit to explicit. Information circulated in the socialisation phase could be subjective and opinionated. As such, individuals could misunderstand this information.

This misunderstanding is exposed in the Externalisation phase; accordingly, information obtained by individuals is verified through interaction, so it is indirectly verified and validated knowledge.

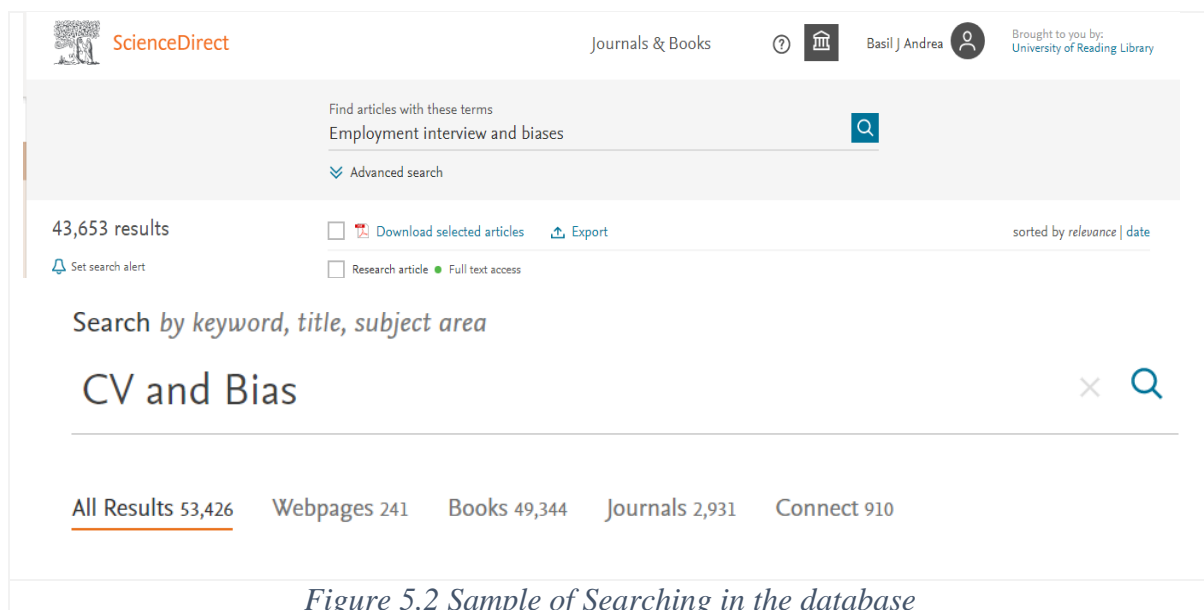
The combination stage occurs when principles from practice are explicitly written as guideline steps, i.e., creating a new principle approach/framework that becomes explicit wisdom. Thus, every person who engages in this process understands and digests the benefits of this knowledge, employing it in the work domain. So, the outcome of the combination stage is both explicit and verifiable. The internalisation stage relates to the continuous education requirement faced by all employees, which explains this knowledge to employees and teaches them the knowledge that has been verified and explicitly existed to benefit both the company and the employee.

Organisations are shifting their approaches by starts considering processes (Knowledge harvesting) rather than individual intelligence ("experiences"). For example, Microsoft, when codifying the operating system, troubleshooting and creating standard procedures. Also, it encapsulated human intelligence within development teams as knowledge contributors. These two approaches are paradoxes between the western and Eastern organisations, as Nonaka and Takeuchi (1995) demonstrated. However, Microsoft's success lies in both models' adaptation by developing many computer forms to harvest crowdsourcing knowledge. Nevertheless, Nonaka and Takeuchi's approach is influential in several modern organisation frameworks, for example, ITIL. Since humans are the source of knowledge; therefore, continuous modification to the organisation process is required because human knowledge is not static.

The continuous modification that helps harness the human experience and knowledge is far from perfection. Also, company employees and managers are not motivated to do two jobs, including day-to-day activities and updating the work process. The reason is that managers did not understand the value of knowledge conversion or process modifications. So the alternative solution is what call knowledge

steward to alleviate this obstacle (Parise, Sasson 2002). The knowledge steward should involve harnessing individuals' knowledge and codifying it, besides the other challenges facing this process. For example, some employees hesitated to share knowledge as it is the power to remain in the position.

The point is that companies require continuous modification and reflection of the process that harvests human knowledge, which is the key to company success; these practices are reflected in ITIL framework companies. However, one of the essential company processes still employing a legacy system depends on old practices, which is the employment selection process. An example is the curriculum vitae, whose roots go back to the 1400s when Leonardo De Vinci introduced it. This inheritance process generates over 43,653 material discussing this subject, "Employment interview and bias" or "CV and bias", considering only the information system study field. This amount of articles justified the problem's relevance to design science and the research community (Hevner et al. 2004). This outcome is only in the Scopus database, as shown in the figure below.



*Figure 5.2 Sample of Searching in the database*

The process that depends on the CV, a legacy process to harness personal knowledge, requires modification. Hence, employing knowledge management methods to harness people's knowledge and prevent the loss of valuable knowledge to society requires a modern system.

In conclusion, knowledge can be either subjective or objective in nature and requires harvesting to help promote continuous organisation knowledge. In contrast, experience is knowing the way something is done, even if it is not the best way. Accordingly, in this research, knowledge is considered of higher order value than experience, and harvesting the best way (i.e., knowledge) is the only sustainable future for promoting companies.

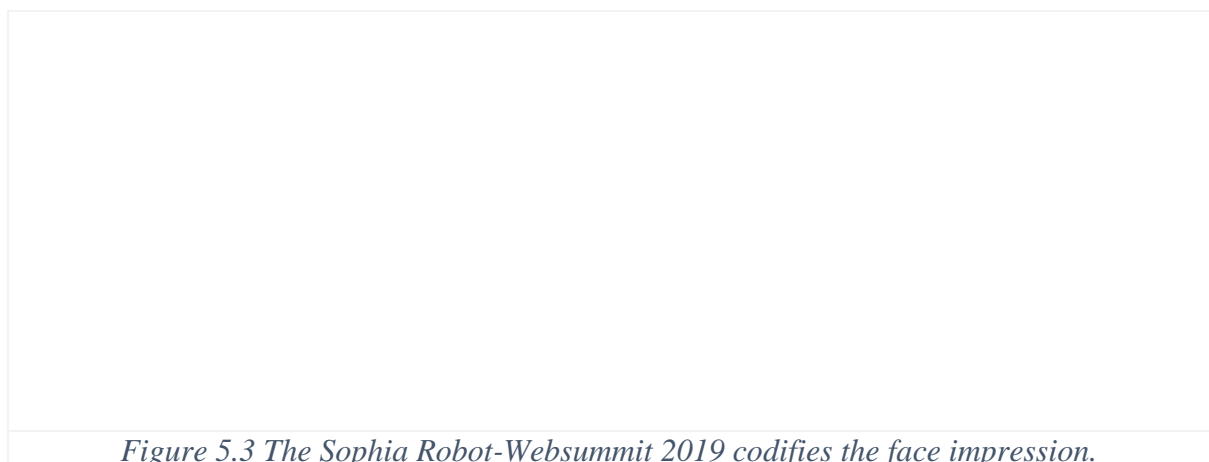
### 5.5.3 Methods Used for Knowledge Codification

Harvesting knowledge to maximise capability positively impacts both corporations and society. Accordingly, organisations must consider methods and approaches to support human knowledge codification. Peter Drucker stated that "what gets measured gets done," famously known as "If you can't measure it, you can't manage it.", famously known as "If you can't measure it, you can't manage it.". Systematic technology and processes are needed to manage human knowledge inside and outside (CV) a corporation. However, such use of technology and processes refutes Polanyi's statement that a "Human knows more than what he can tell," supportive technologies can help humans codify a wide range of the knowledge and experience that they possess.

Most companies have a three-to-five-year timeframe for updating or flagging outdated processes; however, managers are often hesitant to develop a periodic mechanism for codifying tacit knowledge. The researcher believes that there are several reasons for this resistance, yet the main one relates to the vast misinterpretation of Polanyi's argument, and now common assumption, that "tacit knowledge is hard to codify" (Polanyi, 1958).

As previously discussed, Polanyi stated that the owner of knowledge, i.e., the knower, may find it hard to describe (as the knower may unconsciously undertake the behaviour). However, a specialist should be able to record the action, analyze the action, develop a process, and then transfer the knowledge.

To demonstrate this fact and cement the argument again, Polanyi considered how Human expression and body language are learned through years of experience; however, it is tough to codify explicitly. "Imagine trying to write an article that accurately conveys how one reads facial expressions. It would make it nearly impossible to convey our intuitive understanding gathered from years of experience and practice." (Polanyi, 1958). Only recently, facilitated by 3D-camera technology and computer and AI technologies, has semi-realistic codification of facial expressions become possible. Consider, for example, the Sophia robot, who, in November 2017, became the world's first robot citizen.



*Figure 5.3 The Sophia Robot-Websummit 2019 codifies the face impression.*

Sophia is a humanoid machine developed in Hong Kong by the American company Hanson Robotics and first activated on April 19, 201. Accordingly, in 2017, i.e., when she gained Saudi citizen status, Sophia was a two-and-a-half-year-old robot with the image of a middle-aged woman. Sophia's main technological quality is her ability to learn human behaviours through her interaction with people". Sophia can simulate 62 facial expressions (anger, joy, sadness, amazement, annoyance, fear, et cetera ) and has a synthetic electronic voice to support interaction. Accordingly, despite Polanyi's claims, even human expressions can be codified given the abstract intention.

The Navy uses a system called NaCoDAE, an AI "Artificial intelligent." and case-based reasoning to manage the knowledge (Fernandez et al., 2004)). This software is used in the Navy Conversational decision aid environment to avoid loss of knowledge. Conversely, humans are the country and corporation's asset; harvesting this knowledge to maximum capability, in turn, positively impacts corporations and, eventually, society. Therefore, a better system is needed to evaluate and assist human knowledge.

To summarise the above argument, technology and process are needed to manage human knowledge inside a corporation. Eventually, that helps CV knowledge codification. The technology and process will refute Polanyi's famous speech, "Humans know more than what can tell." In fact, technology can help humans express all the knowledge and experience they possess. The Polanyi phrase was a slogan and gained wide popularity in the domain of knowledge management; however, when employing technology and knowledge codification, including automation, Fernandez et al. (2004). This technology changes Polanyi's phrase by accumulating knowledge, and humans can tell what he knows.

Recapping this section:

- 1) Knowledge is the key and has a higher value than experience;
- 2) Tacit knowledge can be codified; however, specialist analysis and access to considerable resources are normally required.
- 3) Humans know more what can tell, i.e. when using a restricted structure (such as a CV); however, when employing a flexible digital media (such as LinkedIn), a human can accumulatively construct a portfolio of what he knows – including information about exams, projects, employment, hobbies, et cetera.
- 4) Considering the mitigation of a subjective interpretation of this database, the employment selection process should be based on a mathematical equation with an explicit variable to measure knowledge and experience in such a database. Using such an equation could arguably be a money-saving outcome since the literature shows that poor hiring practices result in wrong hiring, mismatched knowledge, et cetera.



- 5) Knowledge and experience should matter to the organisation, i.e., impacting organisational success. Accordingly, knowledge should be seen as an asset embedded in the employee's mind, and codification of this knowledge should become part of asset management.

Company value is impacted by knowledge and the organisation's approach to knowledge, which is the central concept of knowledge management. According to this argument, the researcher argues that knowledge is the main factor in hiring practices. Hence, the knowledge argument alleviates a scholarly debate between equity versus quality and diversification versus team fitness in hiring practices. Those debates lead to division and bias "black holes". The design science research framework will be applied to mitigate bias in the employment selection process; however, knowledge is the key.

The following section demonstrates employment selection issues to consolidate that a better system with a mathematical equation is needed to select the candidate. Later an observation of management behaviour and assess if they consider knowledge dissemination and sharing in their work domain. Bear in mind "Solving a problem simply means representing it." (Simon, 1969).

#### 5.5.4 Assessing Manager's Perspective of Knowledge and Experience

This section aims to assess i) how managers appreciate knowledge, ii) whether they differentiate between knowledge and experience, and iii) how managers employ the meaning of knowledge and experience in the employment domain. Accordingly, the researcher discussed the questionnaire results with several managers. The managers were not specific experts in knowledge and experience terminology (Yi et al., 2012; Laura, 2010); however, they were able to critically reflect on the use of information in the context of their considerable business experience.

When justifying a minimal qualitative sample, scholars have different views. For example, Nielson (2000) suggests that five participants can identify 80% of issues. Dworkin (2012) stated that a sample should be between five to fifty, i.e., depending on the case/context, the quality of data, the study scope, the topic, et cetera. The researcher identified six experienced managers who had held mid-level managerial positions or higher. Interview questions were structured into three open-ended questions to i) act as a guide to a conversation whilst ii) not limiting or forcing a discussion on specific points and iii) manage the length of the interview. The researcher used covert interviewing (Myers, 2014) because the people who participated in the interview did not explicitly know the researcher was researching a subject; covert interviewing was used so that participant responses were honest and natural – i.e., removing the impact of the Hawthorne effect. Nevertheless, after each interview was concluded, the researcher gained permission from each participant to use their answers in the research (assuming that data was anonymised to avoid any ethical issues).

In line with covert interviewing methods and to keep the conversation informal, the researcher did not explicitly record the conversation or take notes at the interview point. Just after the interview, however, the researcher made a dictated summary of points into their mobile phone, i.e., to ensure that key points

were recorded when issues were still fresh. Subsequently, the researcher was able to analyse the recording more systematically and highlight the key answers. The study mimics the undercover recruitment researcher addressed in Ch2, the literature review.

The managers were selected from Catenian Association and Church community as an open community, where a researcher is a member of this community. Snowballing participant calling has been employed. First, the senior members of the community (leader) identified different people who are managers involved in hiring and managing a minimum team of five, and the researcher approached them and verified this information by direct questions.

The second inclusion requirement is if they are serving in an ITIL framework company; unfortunately, none of them was an ITIL framework company, but all served in companies that contributed to the knowledge; for example, one manager worked in a company that supported some government departments with technology, thus knowledge as the key for the company.

The question was asked in the hallway where participants maintained distance, and the participant or managers were drinking coffee or tea; the manager's demographic is shown in Table 4.2.

All managers were White English in age, around 60; some were retired, age around 70. Thus, the data collected from managers on an availability basis and what has been recommended by community leaders bear in mind COVID-19 pandemic existed at that time. The data reflect management and operation behaviours in a day-to-day activity that should reflect a method or knowledge; therefore, this data is collected on this basis. If the data does not reflect methods or knowledge, the manufacturer is in a state of chaos. Since the researchers worked in an ITIL manufacturer, the method is known to the researcher as the manufacturer employs the ITIL process, and the data should reflect the ITIL process, where the knowledge is at the heart of the ITIL process.

Questions raised were:

- What is most appreciated when hiring a candidate - the candidate's knowledge or experience?
- What would you do if you hired annoying individuals? Alternatively, "You have been pushed to hire annoying individuals."
- When answering the last question, how did you define annoying in your mind?

The first question aimed to measure how much managers consider/value knowledge within the employment selection process. The researcher expected the answer to reflect that i) people are different, ii) the primary matter is how knowledgeable the candidate is, and iii) the candidate's knowledge could contribute to the corporation because this makes a difference and drives the company forward.

The second and third questions are to understand what the manager defines as annoying; the researcher expects the managers to discuss candidates' unwillingness to share information, codify knowledge, and support others at work. Interestingly this was not the case.

For the first question: i.e., What is most appreciated when hiring a candidate - knowledge or experience?

All managers failed to define the difference between knowledge and experience clearly. Once the distinction was described, most managers stated that experience was more important than knowledge; however, the two issues were directly linked.

For the second question, i.e., What would you do if you hire annoying individuals? All managers answered with the same intention: to isolate and push them out".

The researcher expected managers to ask "why" the employee was annoying or what the individual had done to become annoying; however, no manager did. All participants responded with limited thought and the same meaningful smile, implying that all managers have 'in reality' been in this scenario and had had to make this decision as part of their career.

For the third question, i.e., How to define annoying? Surprisingly, only two managers gave the researcher the same answer concerning meaning. Therefore, what might be annoying to one person might not be considered annoying by a different person. The findings suggest that managers misrepresent the power given to them and that

- 1) subjectively decide what is annoying – however, acting on this definition is universally accepted.
- 2) Using soft skills as a proxy to dismiss employees (Gaether, Dovidio, 2005) is a constructive decision.
- 3) New employees should understand the organisation's cultural mindset before joining the firm and should adapt to fit the organisation (or risk being discharged).

To sum up, the interviewees' managers could not seemingly differentiate between knowledge and experience and appreciate the importance of the terminology distinction. Managers have misrepresented their power by jumping to answers without in-depth consideration. Alternatively, managers behave according to their agenda and, by employing their instinct, being open about making a decision that expresses significant bias.

This covert interview data provides only anecdotal evidence. Accordingly, in the next section, the researcher explores an empirical case to examine management decision-making behaviour in practice. In this section, the study conclusion is not based on anecdotal evidence but on real management behaviour within a real-world case environment.

### 5.5.5 Observation of Manufacturing Error to Appreciate Decision Makers

Since this research considers Informatics, the researcher investigated IT incidents at a Diesel engine manufacturing plant, examining whether managers employ knowledge and experience to tackle reoccurring IT problems.

The secondary data collected was requested from managers who downloaded the data from an American automotive component manufacturer's education side; this manufacturer has an education component

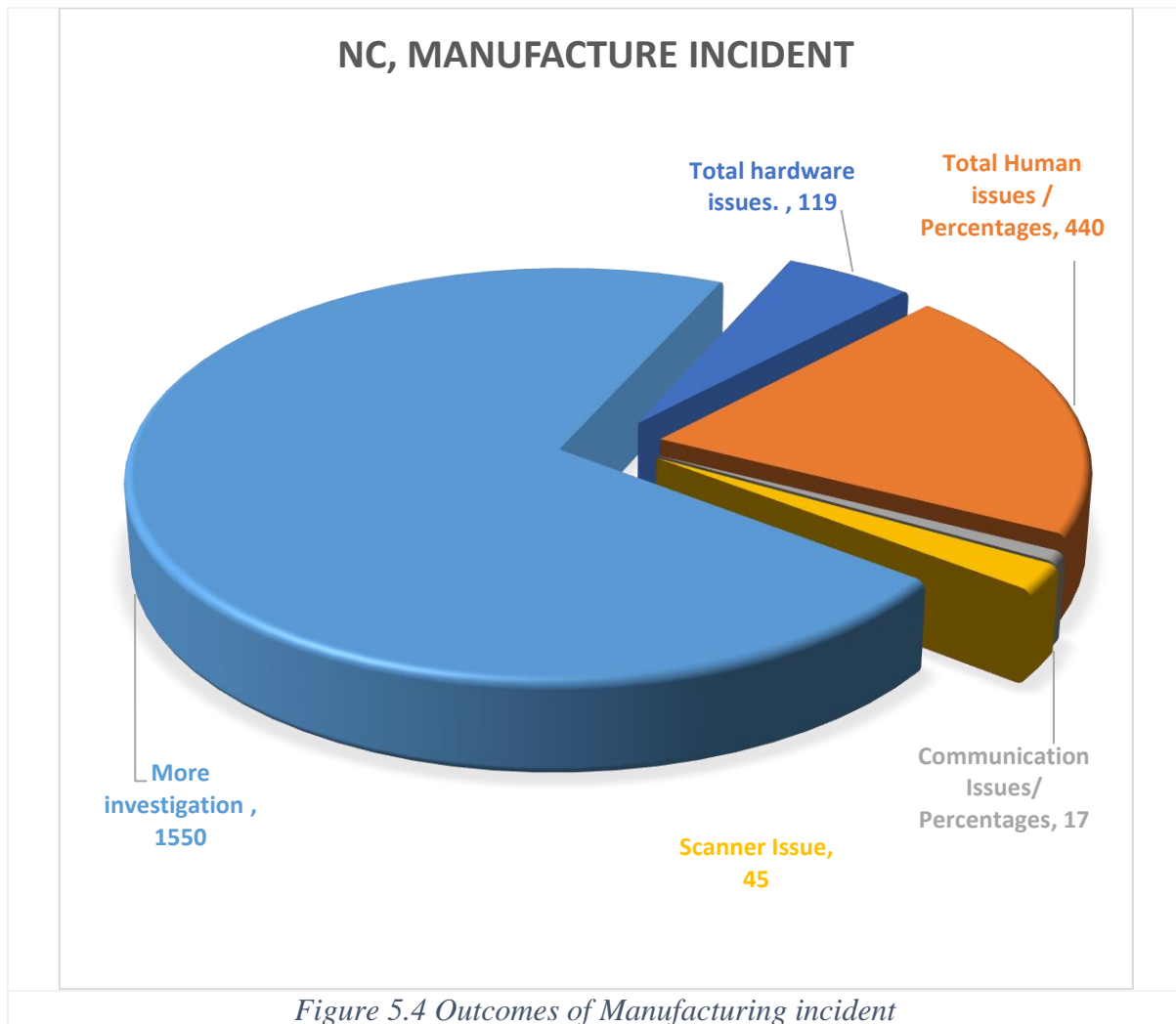
that trains college students as undergraduates two years technical students. The data reflect management behaviour as the ITIL framework considers knowledge at the heart of the framework. The data reflect how management behaves to fix errors and improve productivity

Also, to explain why we have some data before starting the project because the data was obtained from an earlier study conducted at the University of West London in 2016.

The data were merged ( the ones owned and the ones that come from managers) and added together, then thematically analysed as shown in Appendix J, which colour coded in an Excel file. In this time frame, the manufacturer has totally changed, become robotics-based, and the researcher has no further contact with them.

The researcher analysed data concerning 2192 IT incidents: 119 related to hardware issues (green), 440 related to human issues (orange), 17 incidents related to communication issues (yellow), and 1550 incidents were not categories (related to scanners issues in "Red" and other issue related to testing code and unknowns under further investigation and required more investigation).

Figure 5.4 shows an example of collected colour-coded data, which for each incident consisted of data about date, location, times reports, times cleared, manufacturing downtime, and information reported.



So, the functions used in the file calculation for information and in case of repeatability or further investigation of the data are: [ =@CountCellsByColor(H16:INDIRECT(CONCATENATE("H", B7)), E5) ] This formula is repeated to each colour concerning changing the location of H16 according to cells colours. The B7 is the end line number, and E5 is the colour code. So, this function will calculate data automatically as soon as data is placed in the file and classified; thus, humans must read each line and classify the errors.

The number of lines counted by the formula [ =COUNTIF(D15:D4000,"\*")+15 ]. Alignment is also used as the formula [ =RIGHT(J5, LEN(J5)-SEARCH(":", J5,1)) ] for the time format supported by another formula to divide the time by 60 and round it, where the time in minutes divided into two section minutes and hours, also for assurance used the function (convert X, min, hour). Due to excel calculation, additional function as (=CONVERT((K5+K6+ K7+K9), "mn", "hr") due to time rounding in excel. However, the primary function is the calculate the colours after theming them.

These data are verified daily in collaboration meetings between manufacturing operations departments and technical operations departments. The data reflected management behaviour concerning operation

issues and showed the implicit meaning of how managers consider knowledge and experience in their decisions and actions see image below.

The main concern in this study is human errors and how managers act. For example, when the same issue happens repeatedly, what action does management action take, and how do managers employ knowledge to overcome these issues? The data was collected in an Excel file, and Excel equations were used to count the number of coloured lines. Also, the total downtime was calculated, allowing the researcher to consider the total time in minutes, which is important as the manufacturer charges the department \$1500 for each minute of downtime.

According to the data, it is evident that managers do not consider knowledge dissemination as a solution to overcome incidents. The data shows that 20% of all incidents, which is equal to 50% of the well-understood incidents, can simply be resolved by telling the operator what to do explicitly. Accordingly, the downtime could have been reduced significantly by ensuring effective dissemination of knowledge amongst staff. Some of the unknown errors are arguably also related to humans; however, due to the nature of the issues, there was some ambiguity in the nature of the error. For example, a “bit 12 not arrived” error suggested that the RFID has low power.

Although this was most likely due to no one changing the battery on this RFID scanner, the technician would sometimes blame the communication protocol “parity bit” or the PLC cable. All mentioned issues could be fixed; however different stakeholders (for example, scanner technician and network engineer, et cetera) were responsible for different incidents, and therefore, poor communication and management of job scope and poor knowledge dissemination; resulting in downtime that i) could have easily mitigated) allowing each operator to sign off the whole and ii) document and disseminate these unknown issues from tacit knowledge into explicit processes, i.e. applying the SECI to mitigate future occurrences.

[illegible]

Human error in 17 months and unstructured snowballing dissemination of knowledge resulted in 2611 minutes of downtime. The cost of each minute is \$1500 US, as the manufacturer is unproductive yet is still having to pay staff and maintain facilities.

The financial loss was approximately 3.9 million US dollars. When we consider the manufacturing profit during the same duration (i.e., 350M), we can see that such petty IT faults resulted in a loss of about 1%. In response, management decided to remove the human factor by employing automated technology and robots. Although this manufacturer was making a good profit, and thousands of families relied on this company for their livelihood, the management decision ignored people's well-being, resulting in lots of people being replaced by robots. Interestingly, however, the heavy robots still required human maintenance and recalibration to support different kinds of day-to-day activity.

The adoption of robots demonstrates management bias against human operators, evidenced by Strauss (2015), who shows that biased and prejudiced in the manufacturing environment by management reached the level of threatening the operator's unions. Also, robotics fails to eliminate the majority of issues (for example, printing, PLC, and scanning for product management); since human-related errors only account for 440 of the 2192 incidents considered (i.e., 20%).

This section will discuss several errors in order to expound why errors happen and how such errors could be eliminated with minimal or zero cost - saving the company millions.

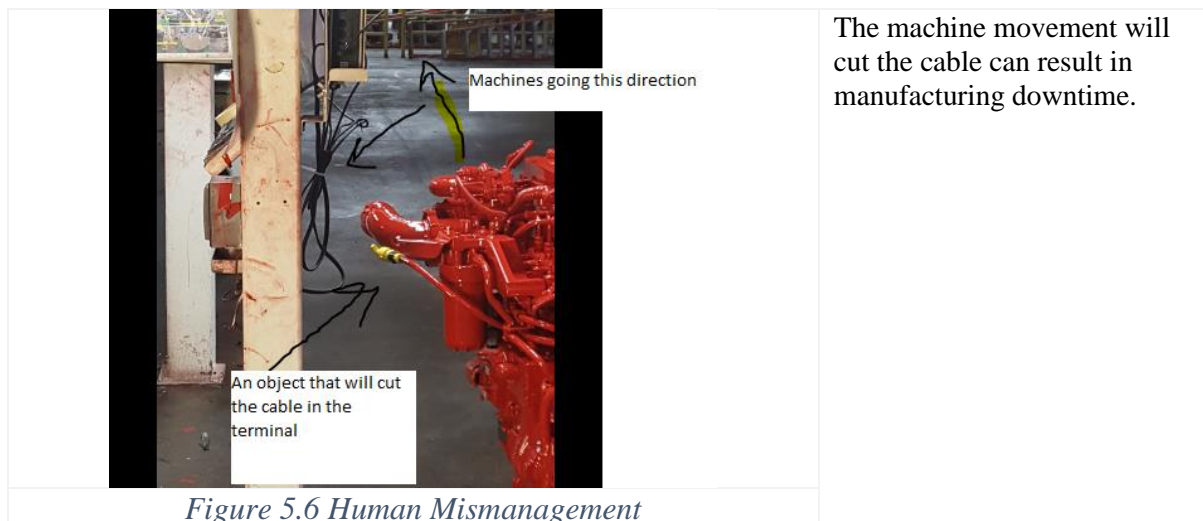
The considered errors are human errors accepted by all departments and other human errors that could be controversial and argued as technical. In reality, these errors reflect a distinct lack of human management, consolidated by managers employing their instinct to solve errors without employing knowledge and sharing knowledge. Such errors in daily activity reflect management decision-making behaviours yet mirror the selection processes in the employment selection process. Thus, the data reflects mid-management behaviour and the system gap that leads to local management being unchecked and free to employ their own biases in an uncontrolled environment.

### **Example 1 – Cable failure**

Figure 5.6 shows that machines on the production line go in a specific direction; however, poor management of cables can result in the cable getting caught on equipment and cut. A cut cable can stop the manufacturing terminal (for around 5-10 minutes) whilst the error is identified and the cable is fixed. This issue of repeatedly cutting cables occurred in the data, costing \$1500 US dollars each minute, preventing production. Suppose the SECI framework were to be employed in this manufacturing process. In that case, appropriate education/training should be in place (as socialization) to make people aware of the risk and impact/cost to the organisation. Next, someone should document this knowledge and consider where the cabling solution is failing and what alternatives could be used, which is part of the externalization process. Even if employees do not have enough time to read this document, a combination of process change and tacit reinforcement should be used in each employee (as internalisation) to either remove the risk or check the cable each time equipment moves. For example, an employee may sound an alarm when issues are potentially spotted. Through iterative process improvement, supported by effective knowledge dissemination, there is a good chance that this error can be removed



forever and will never be seen again. Alternatively, employing a process and procedure with an explicit system will totally resolve these issues.



Thus, only through identification of the problem and codification of knowledge, adaptation of the process, education formation, and knowledge dissemination can we presume that operators fully appreciate i) the impact/significance of the seemingly small IT problems, ii) that they are responsible for maintaining their own terminal, and iii) what they should do if they spot issues. However, when asking the operator, they often responded with answers, such as "I do not have a cable tray to secure the cable." Or "I told my team leader verbally". However, since there is no process/framework for managing improvement, and no one cares about the bigger picture (instead of focusing on just their responsibility), the team leader forgets until the accident happens again.

### **Example 2 – Damaged Scanners**

Another observation by the researcher relates to the handheld scanners becoming damaged at the manufacturer. The scanner is a special piece of scanning equipment which the operator uses as a management tool. When a worker adds a part to the machine, the part is associated with the specific product using the item scanner. In this way, each machine has a list of parts that were used in its construction. This documented metadata (serial numbers, manufacture ID and other information) is critical to support reverse supply-chain analysis.

In the manufacturing process, the operators use the scanner multiple times for each machine; however, operators do not always place the scanner back in its scanner holster correctly (see Figure 5.7) – as the positioning of the scanner holster is inconsistent between terminals. Moreover, different operators leave the scanner in different positions; yet, wrong placement of the scanner can result in the costly scanners getting broken – and more downtime to replace it.

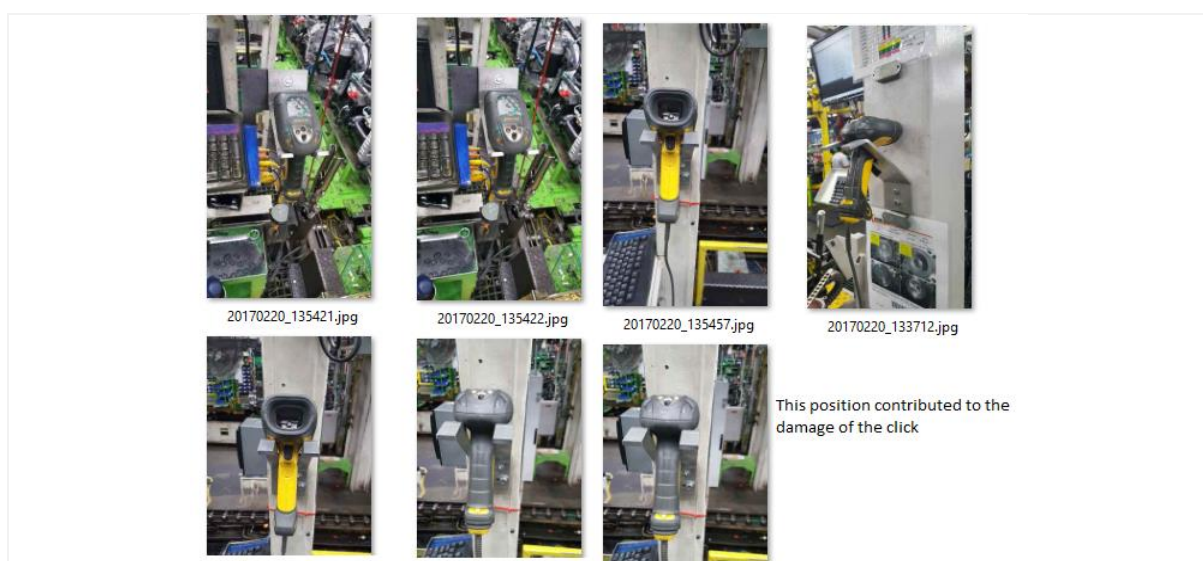
In the past, management ordered that operators place the scanner holsters in three positions; however, when operators move between terminals, staff can get confused, resulting in the handheld scanners getting broken because operators act tacitly. So, when putting the scanner in the wrong position, it got broken.

If a new staff member is introduced properly to the manufacturing process, they will act according to the agreed knowledge before proceeding with the decision; because the inexperienced staff member knows that the knowledge has to pass the four SECI knowledge cycles. If managers do not know what to do in a specific situation, i.e., instead of ignoring the operators, they could check the knowledge base and work accordingly.

The author finding argues that the manager did not investigate before giving the orders; the manager should have enough knowledge to run the position, not decide based on an instant solution. The main issue is that managers acting as the manufacturer owners and operators should adapt to their decision. The fact is that they are just managers paid to manage and support the operators. So, if we have framework control managers, and each manager should justify their orders and place them in the knowledge system, this will not happen. Thus, managers should harvest the data, agree on the best approach, and then employ it and place it on a knowledge-based basis.

The proposed approach should be shared as socialization with other managers as this is a global company, then converted to explicit as externalization, and studies as a combination then exploited to all managers as internalization (Nonaka and Takeuchi 1995).

The argument is that if we place any new graduates, they will act accordingly to the knowledge and collected data before proceeding with the decision because the knowledge for the new graduate has passed the four knowledge cycles through teachability and has no experience influence. Even if managers do not know what to do with such an approach, they can still check their knowledge-based and work accordingly. However, those managers insisted on ignoring the operator.



*Figure 5.7 An example of human factors leading to downtimes'*

### **Example 3 – Terminal not Responding**

Another issue repeatedly appearing in the data was "terminal not responding". To 'solve' the problem, the technical team advised the operator to disconnect and reconnect the ethernet cable. This process solves the problem because it initiates the handshake protocol in the network operating system. However, unplugging and re-plugging the cable can result in the plastic clip bending or breaking, thus removing the functional reliability of the connection, a fact compounded by the vibration of heavy machines, which can result in significant packet loss and an intermittent and hard-to-identify fault (see figure 5.9).



*Figure 5.8 Wrong advice results in cable issue*

In addition, sometimes, a delay in communication traffic will occur, resulting in the operator disconnecting and reconnecting the cable, even when a fault has not occurred if a false error is reported, then the technician is ordered to solve the problem without considering why this error happens, and how it happens.

In this example, there is limited consideration for the true reason for the message's terminal not responding. A fix-it quick tacit solution had been identified and disseminated (tacit-to-tacit), yet this disconnect and reconnect solution is i) not documented, ii) not defined after applying the SECI cycle, and iii) has not been verified as an appropriate solution mechanism. Interestingly, operators do not seem aware (or care) whether the constant disconnecting and re-connecting of the cable is the right or wrong long-term solution since reconnecting the cable solves the problem for a short period of time. Unfortunately, the solution manages the symptom of the problem yet causes other issues, such as the breaking of cable clips resulting in changing cables because replacing water-sealed clips is not an option available. The

sum of dropout time is arguably greater than if the 'terminal not responding' error had been properly understood and fixed.

The solution demonstrates a 'wrong action' even though the technician knows the (ping command). Still, they might not have enough knowledge to use (ping parameters) or apply a (ping /t) in order to ping the system and identify where the lack of response occurs.

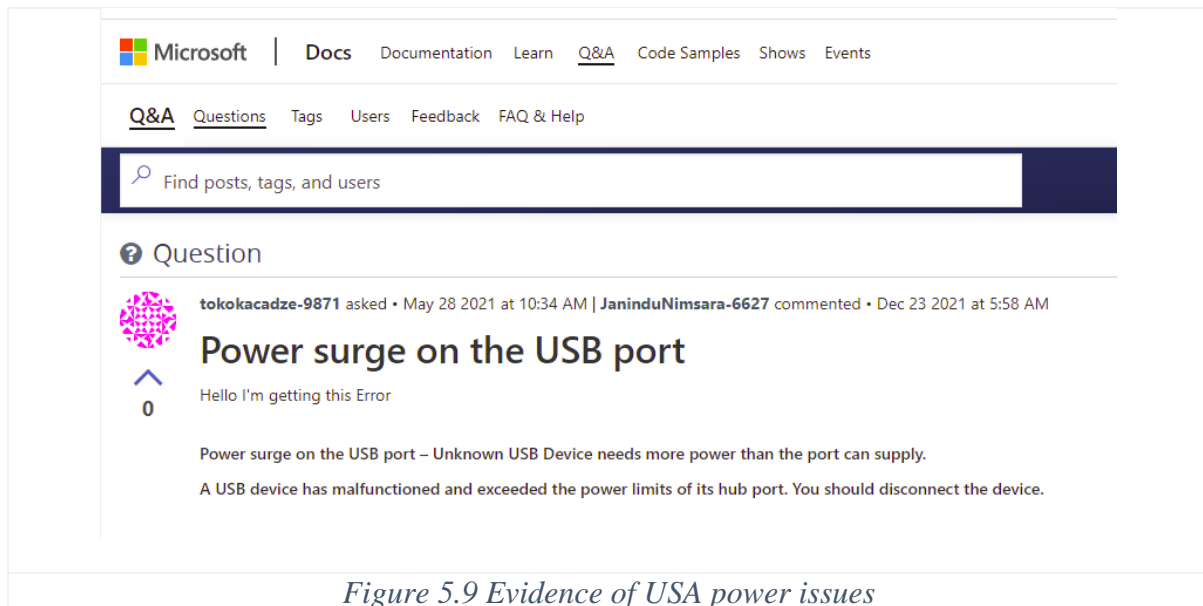
A scientific solution might be creating a batch file with a "ping command" to verify the connection. Alternatively, the operator could be taught how to restart the service. The defined solution in this example implies that technicians are either unqualified or have gaps in their knowledge. These gaps had led to a poor workaround solution that resulted in many ethernet cables getting broken, many cables getting replaced, iterative errors and downtime.

Suppose the SECI framework has been used to understand the problem and document relevant knowledge. In this case, this issue would be discovered by strategic management, other shift supervisors, or any practitioner, then it would become a whistleblower, employee knowledge gaps would have been identified, and a single solution could be iteratively developed and disseminated, resulting in a significant reduction of error rates and downtime costs.

#### **Example 4 – USB not responding**

Another issue is "USB not responding and sometimes causing rebooting terminal with disabling USB". The author investigated this issue, and the finding is that operator left the computer mouse upside down for a long time at night time end of the shift, which caused to reboot the machine after USB frozen, the author replicates this error more than ones and the outcome when you leave mouse upside down for long time overload will stop the USB, then unresponding USB cause the machine to reboot with disabling the USB port.

Those manufacturing terminal called "think client" has min-windows, not a full version of windows. So, an order has been given to reboot the machine. However, a simple search on Google (See Figure 5.9) shows several Microsoft pages describing the problem. The solution is to ask the operator to be more responsible, make sure everything is in place before the end of your shift and explain what happens to the machine when you dump it at the end.



*Figure 5.9 Evidence of USA power issues*

### Example 5 – Poor Cabling Issues

A number of other issues, for example: "Unplugged Power", "25-pin adapter broke", "network cable not fully seated.", "Monitor power cable unplugged.", "Broken Scanner trigger cable", "monitor power cable caught in the tool", "monitor screen blank due to pc power off", "data cable unplugged", et cetera, all demonstrated faults due to poor cable management (see figure 5.10)



*Figure 5.10 Common Cabling issues.*

Poor cable management can be fixed through appreciation of the issues (via socialisation), documented as externalisation, studied as a combination, and exploited as internalisation.

The researcher encourages businesses to get operators to sign a document accepting responsibility for space management (within a punishment-based bureaucracy) to ensure the operator's cooperation. The

researcher believes that such operators will willingly cooperate, as the operators seemed happy to follow instructions (by the book). It is also critical to ensure that the operator knows they are responsible.

Another general observation outside this environment and in a public environment could be considered as data triangulation to the above study finding. The researchers compared management behaviours toward data collected in manufacture with management behaviours in the public domain after observing and experiencing the process in the public domain, then logically compared the two process's outcomes. The outcomes show an inefficient process, reflected by the manufacturing case incident and case discussed below, which in both cases reflected faulty processes and a lack of continuous system improvement. Otherwise, the same error will likely repeat as in the manufacturing data. For example, many corporation directors configure the team to open plans, as collaboration becomes a corporation interest, and lots of companies start this process by copying each other. The question is: Are those directors considering the right environment for the right team?

Alternatively, just copy each other. For example, an open plan is employed in an operation or calls centre. At the same time, end-users complain that too many people are talking simultaneously. This is because of the lack of a sound barrier between operators. So, no employee or direct manager informed of this decision would not work in such an environment. Towers Watson's study shows only 37% employee engagement at work; this by a specific set of questions to measure engagement negatively impacts collaboration.

The argument demonstrates the same finding that directors are not choosing the right decision, and there is no collaboration from the team around them all the time, which cemented Tower Watson's study; there is no engagement. However, everyone trying to make his leader happy agree with the leader's decision without further and honest investigation. This approach ends up with an open plan in a call centre that is not the right decision. Successively, directors' illogical constraints lead employees to disengage at work and only care about delivering their job irrespective of whether they are right or wrong.

At least the capital budget for global fast food like McDonald's for 2018 is a whopping \$2.4 billion (£1.7 billion). However, when such a big company conducted a survey analysis that violated all rules and guidelines. Collected data that has nothing to do with reality but has zero value.

The discovery through observation. First, the survey process starts when people enter McDonald's to buy a sandwich. Second, people will get an offer as an extra sandwich if the buyer participates in this survey. Through Seven observation cases, no one even read the question, just answered Yes. McDonald's is collecting data in this process, but what is the integrity of this data? Back to the author's question, is the one who designed this survey qualified to do the job? Is this person engaged in his job or just doing his job? The above argument calls the Abductive-reasoning and logic method, as the author observed the phenomena and analysed the events. So, the question is, who designs this survey? What qualification and background lead to the survey design collecting data but zero facts?

## Relevance Cycle Conclusion

The researcher showed throughout these real-world examples that many manufacturing incidents resulting in production downtime could be quickly and easily mitigated by applying knowledge codification and dissemination.

The researcher concluded that almost anyone could maintain the existing manufacturing process, yet this does not mean that the manager is employing the resources and the capability of the production line to gain maximum performance.

Instead, managers should employ system two, systematic and logical thinking (Kahneman (2011); management behaviour often appears to be driven by instinct. Thus, placing the same argument in the employment domain, Winninger (1996) stated that 70% of all hiring decision outcomes were based on personal chemistry; few interviewers seemed willing to consider that the person they dislike may be the best candidate for a given job (Winninger, 1996).

Within the first section of this study, the researcher highlighted the misinterpretation between experience and education and showed that recruiters often link success and knowledge with the length of time that someone has been doing the job rather than the knowledge gained. In most jobs, after six months, day-to-day activities become routine. Accordingly, the value gained by the additional duration of experience provides a depleting return over time.

A candidate with one year of experience or ten years of experience may have a similar breadth of experience; the person with ten years of experience has had the same experience multiple times. At this point, non-mandated day-to-day decisions are most likely based on the person's awareness and opinion rather than employing additional knowledge. This point was demonstrated in example 2 (broken scanners), where managers advised placing the scanner holster in several different positions without understanding the situation or the operator's needs.

This decision led to a \$67,500 cost in downtime and the replacement of 45 broken handheld scanners (costing the company \$9,000). The example of a Handheld scanner explains how managers employ their thinking without studying the situation. By systematically applying the SECI framework when faults occur, any novice researcher could have formed an adequate understanding of the situation, asking the right questions to codify the knowledge, allowing the business to define a knowledge-based solution. This argument and observation suggest that years of experience could be linked to well-being rather than knowledge acquisition.

Managers, for example, appear to employ their instinctive feelings when applying solutions without considering their knowledge. Suppose they use the same approach when hiring as in the examples. In that case, managers will fail to follow documented knowledge to solve the problem, instead claiming

that a non-knowledge approach, such as a focus on the experience or personal characteristics, is the right way.

The question is if this is the right way. Is what they claim true?

In conclusion, from the observation examples above, the researcher can conclude that systematic consideration of knowledge and experience is not frequent among managers of the production supply chain. From anecdotal evidence, the researcher will assume that this is the same for the employment selection process.

We showed managers i) seemingly misunderstand the difference between knowledge and experience and commonly consider that experience is more valuable than knowledge; and ii) choose to engage with and employ instinct and feeling when making decisions, evidenced by the identification of subjectivity in the manager interviews, analysis of manager behaviour within the work environment, and consideration of response (i.e., decision making) concerning simple IT incident that shut down the manufacturing process; resulting in a significant negative impact to the organisation.

The data clearly shows that experienced management agrees that the technician provides an unscientific solution. In contrast, any knowledgeable novice at this point could provide better advice. The author is aware of the ITIL framework or the SECI, which reflects a codification of knowledge and experience in the work process, and considers the knowledge database as the system's heart. However, applying the above observations to the employment domain is called knowledge by extension Kaplan (1964); the author is convinced that a mathematical point system is needed to evaluate the employment selection process from the knowledge and experience perspective. In such cases, overcome management decision bias.

However, the researcher is convinced that the adoption of ITIL or SECI frameworks, and a mathematical points-based system, is needed in the employment selection process to distinguish between knowledge and experience perspective, thus removing subjectivity and bias.

## 5.6 Discussion

This chapter has employed abductive logic and reasoning, also called abduction or abductive inference, to find the simplest and most likely explanation for the observations. Moreover, the researcher applied a 'wisdom of the crowd approach, i.e., where an open qualitative data collection method was employed. Accordingly, the researcher analysed and observed several case examples, collecting both primary and secondary data, and was able to demonstrate the following:

- 1 Some managers do not fully consider the value of knowledge, which the researcher infers to be reflected in the employment selection process. The data shows the same errors repeated, like cable cuts; if this problem is considered according to the SECI or ITIL processes, this should be removed from the data. P33



- 2 Some managers lack an understanding of knowledge terminology and consider experience as the only true factor, whereas knowledge is the only true factor, according to the literature demonstrated in section 5.5.2. This is demonstrated as direct questions and answers, as shown in section 5.5.4.
- 3 This chapter shows that managers measure experience by measuring duration in years. However, the literature suggests that experience should be measured by task depth and variation; this fact reflects in the job descriptions.
- 4 Managers consider experience to be of higher value than knowledge; however, the commercial knowledge framework considers knowledge the heart of the system, as shown in ITIL or SECI frameworks; this is demonstrated in section 5.5.4 through direct conversations with managers.
- 5 Accordingly, further training for managers is required to understand the value of knowledge compared to experience.
- 6 The employment selection process is outdated and requires modification to incorporate consideration of knowledge more systematically. The Environments cycle supported this fact, as discussed in the literature.
- 7 Managers sometimes (consciously and unconsciously) abuse the power given to them, especially in the employment selection process, to better their own situation within the company. This was demonstrated via an interview with managers who suggested unjustly pushing anyone they dislike.
- 8 Literature suggests that managers who lack a detailed understanding of the job process for the new hiring and role requirements, where they stat demand knowledge that does not apply to the job.
- 9 Lack of codifying of knowledge, especially the explicit converting from tacit in the working process, has several consequences. Although a focus on this is not the study's concern, the absence of a formalised mechanism to capture and integrate key knowledge continues to have a significant impact on the effectiveness of the employment selection process and highlights a gap in the vast literature concerning tacit knowledge. Lacking this process leads to repeated errors in the manufacture.

The researcher concludes that the employment selection process requires modification to ensure the mitigations of management bias from the process. Moreover, and in light of clear data that suggests that managers feel that it is acceptable to push people out of a role for subjective reasons, managers should be trained, as part of a knowledge capture approach (such as the SECI framework), to respect the wider value of knowledge, and differentiate between knowledge and experience in their workspace.

Accordingly, since managers are considered the loop control component, a mechanism is required in the employment selection process to monitor hiring decision-makers.

## 5.7 Contribution and Conclusions

The study highlighted wrong practices in the employment domain, which consider experience to have a higher value than knowledge. Findings showed that decision-makers abuse authority and that what they say, focusing on expertise and soft skills being best, is not always true.

Although some managers do understand the value of knowledge in a corporation, this appreciation of knowledge, however, is not always employed in their work, for example, their focus on the adoption and use of the traditional ‘interview/cv’ selection process and dependence on experience duration rather than knowledge. The researcher concludes that a better system is needed to calculate applicant knowledge and experience due to misinterpretation of the terminology and through knowledge.

A hiring system purely dependent on CVs and interviews to harvest candidate knowledge is, as highlighted in section 5.4.2., not fit for use and purpose due to employers changing requirements and the need for additional documents. As such, the researcher agrees with Polanyi’s paradox, which states that “humans know more than they can tell” when there is no system in place to harvest knowledge. Also, concludes that a new approach is needed to harvest human knowledge and experience. Furthermore, employing those terminologies in the hiring system removes scholarly debate concerning cultural fitness versus diversification, or equity versus quality, as consideration of knowledge is the only factor that makes a difference for corporations.

This chapter refutes those who oppose the codification of tacit knowledge, highlighting that tacit knowledge can be coded if systematically and iteratively analysed by an external perspective. Furthermore, a periodic review of knowledge is required, as suggested by SECI, to ensure the evolution of corporation processes and procedures in line with societal and organisational change.

The researcher suggested the use of a possible online solution, such as a social media platform (similar to LinkedIn), yet with i) additional protection to ensure reliability and ii) the integrated ability to gain external authentication and validation of claims; thus, allowing the verifiable collection of evidence concerning knowledge and experience claims.

In this way, humans will be able to

- 1) Provide a prospective employer with all the knowledge that could possibly be useful.
- 2) Mechanisms to authenticate claims.

Since the amount of information placed within this media platform could be substantial, making it time-consuming for the potential employer, it would be possible (in the future) to incorporate an artificial intelligence component to systematically ‘scrape’ the database, and use open and predefined criteria, assign points to certain media content; thus reducing the initial load and burden of reading all information.

Achieving this step would refute Polony's statement, as the applicant could systematically codify whatever information they believe to be relevant to their preference concerning future employment. If a company could effectively codify the role, and candidates could codify their knowledge, then the hiring process would become quick and efficient.

## The Knowledge-Base and Rigor Cycle Second Iteration

### Chapter Six Second Iteration

#### Knowledge-base and Rigor cycle

##### 6.1 Introduction

In chapters 4 and 5, several papers demonstrate how knowledge might be subjective yet is still important for hiring decisions. Due to this subjectivity, job applicants believe that the employer's choice is biased and are unsatisfied with it. Therefore, this chapter aims to remove subjectivity from subjective knowledge by codifying it; this task is accomplished by integrating the knowledge-creating SECI framework (see Figure 5.1). The SECI framework, which stands for Socialisation, Externalisation, Combination and Internalisation, integrates and expands Michael Polanyi's work concerning organisation knowledge to support knowledge creation in organisations. Although multiple scholars recommend integrating the SECI in HR practises, none of those scholars addresses how to integrate SECI in employment selection.

Chapter 6 justifies the specific use of SECI in the employment domain and considers how to incorporate SECI into the employment selection domain. The outcome of the integration could be used as a standalone and independent method, i.e., to support the mitigation of employment selection issues and biases. However, the outcome of this chapter will be used later in the thesis (in line with design science methodology) to support the development of a final solution artefact.

The traditional employment selection process often relies on subjective manager assessment for subjective knowledge owned by prospective employees, and many job seekers interpret the outcome/decision (rightly or wrongly) as unfair and biased. The employer is likely to have (rightly or wrongly) a different focus to that of the rejected candidate, and the feedback stating the management decision might be seen differently. This case is if candidates do not believe that feedback, assumptions, or claims about their application are true or accurate. If they feel their application was misunderstood or purposefully misinterpreted, the job seeker will likely feel that their right to equal opportunity has been violated. This belief leads to several complications and impacts individuals differently, consequently impacting society.

There is no enforcement mechanism in the traditional employment selection process to allow the job seeker to critically question the reasoning of the selection decision (based on biased or inaccurate information). This is because the hiring process is a linear assumption that the manager's interpretation of the job seeker's knowledge and the ultimate decision is unquestioningly correct. Chapter six aims to support the critical questioning of subjectivity by using an iterative selection process artefact, considering verifiable knowledge as the main factor of importance. Worth to address that it is complicated for law practitioners to prove otherwise due to the high subjectivity. The methods employed in this chapter

are drawn from the knowledge management domain and stand as kernel theory within the design science outcome. Thus, chapter 6 will describe, justify, and adopt the chosen Nonaka and Takeuchi methods to codify knowledge, i.e. the Rigor cycle for the second iteration of the design science methodology.

## 6.2 The Knowledge Base step in Design Science

The researcher in this stage seeks and searches the knowledge-based for a theory or method that could be used to i) ease the design problem and ii) add rigour when employing it in the Rigor cycle. This study aims to answer how to codify knowledge and justifies best practices when managing people's knowledge.

Scholars interpret and explain the process of knowledge codification into information differently. So, Sorensen and Lundh-Snis (2001) view codification as a classification process. In contrast, Baumard (1999) talks about the codification of research data, compared to Davenport and Prusak (1998) explain codification as the process that converts knowledge or information into an explicit form; in this way, knowledge transferability is a straightforward process concerning knowledge complexity. This fact, in turn, means that the codification includes both (Sorensen and Baumard) descriptions beside endless other definitions (Davenport and Prusak 1998).

This paper adopts the Davenport definition, so codification means automation involved technology, classification of knowledge, explicit process, or converting the task to explicit.

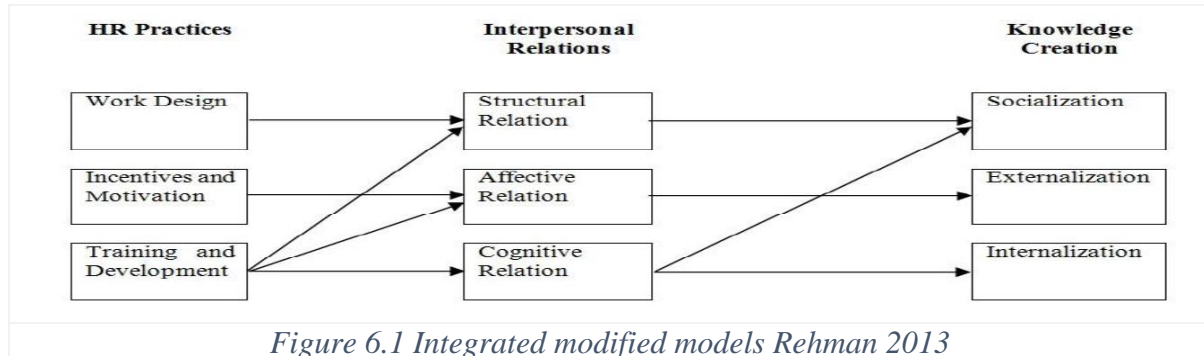
The question addressed in this chapter is: How can we remove subjectivity from 'knowing'? Accordingly, the researcher will i) search the knowledge management literature for a theoretical solution and then ii) attempt to justify using the method that will become the kernel theory from knowledge management as a component in the employment selection method. Employing these methods will add Rigor to the design, so the Rigor cycle uses the theory that can be considered the kernel theory for the design.

## 6.3 Justification of Knowledge management in the Employment Domain

Scholars agree that knowledge management aligns with HR practices, as demonstrated in the past chapter. Accordingly, different approaches and frameworks have been used to link HRM with knowledge management. For example, Bailey and Clark (2000) discuss knowledge management concerning 'essential knowledge to the organisation' and separate this distinctly from 'crucial knowledge to the individual'. Bailey and Clark emphasized what they call "currency", i.e., the knowledge necessary to the organisation's success, for example, strategy, operation, or change management. On the other hand, Lowenthal et al. (1999) categorise knowledge by considering whether the value created by the knowledge has a direct or indirect impact on knowledge creation for a client. For other frameworks examples, see Taminiau et al., 2007; Kaše et al., 2009; Kase, Paauwe and Zupan, 2009; Swart and Kinnie, 2010; Rehman, 2013; Mabey and Zhao, 2017.

Rehman (2013) recommended using SECI in HR practices, yet Rehman did not describe how this could be done in practice. Rehman also developed a descriptive conceptual model which combined Nonaka

and Takeuchi's SECI framework (1995) with an enhanced version of Kase, Paauwe and Zupan (2009) – see figure 6.1. Thus, the model considers how HR practices (i.e. work design, incentives and motivations, and training and development) can influence interpersonal relationships (organisation structures and the way that people think and act together), which in turn impact knowledge creation.



Rehman's model highlights some interesting points, the iterative nature of knowledge formation, as defined in SECI, and the lack of consideration of organisational combination reduces the value gained through the integration of knowledge in the organisation.

Nonaka (1995) developed the SECI model as a generic framework to harvest, codify, share, and integrate knowledge within corporate processes, i.e., to develop new knowledge through a structured solution. It is worth mentioning, however, that i) there is a direct link shown in chapter two correlated knowledge, process and hiring; however, the SECI framework does not include a precise method to identify and link "How/What/ When" knowledge links to HR, and ii) no-one has suggested a framework as a panacea that all companies could use and supports (and encourages) relevant modification best to meet the specific needs of the local environment.

The proposed system applies the wisdom of the SECI framework and allows:

- i) Consideration of the link between knowledge creation and HR.
- ii) Provides a structure that can be flexibly shaped if and when specific process/knowledge customisation is required.

Nonaka and Takeuchi (1995) expressed the idea of the Hypertext organisation, which combines a highly hierarchical organisational structure with highly flexible management solutions in order to support the efficient conversion of various types of knowledge (both implicit and explicit) throughout the organisation, i.e. to maximise value creation in a business process. Within this structure, Nonaka introduced the idea of middle-up-down management to support the creation of new knowledge via socialisation between everyone in the organisation.

The framework defines all employees as critical to value creation because it raises "serendipity", which increases the chance of new knowledge forming, i.e. since different ideas and the integration of

feedback from various individuals support the formulation of new ideas. Numerous researchers propose that serendipity is linked to knowledge creation and the quality of research findings, for example, Easterby-Smith et al. (1990); Sunnier and Verkaaik (2005); Mirvahedi 2014; Niculescu (2017)). In fact, Mirvahedi's (2014) complete thesis considered serendipity and articulated how much past discovery can be linked to serendipity. Accordingly, although the owner can choose to accept or exclude useless information subsequently, it is wise to employ a crowdsourcing mindset for knowledge creation and engage all employees, even when the problem is complex.

This point, however, highlights a conflict, depicted clearly by Nonaka and Takeuchi, between the thinking of eastern and western companies. The western approach normally defines the development team as the key contributor to the creation and formation of knowledge, as it is their job to identify new solutions to an identified organisational problem. In contrast, SECI, which was developed to support knowledge creation in eastern organisations, considers all employees to be knowledgeable contributors. Adopting this eastern approach is essential since the mutual allocation of responsibility and knowledge mitigates several issues and biases in the employment selection process. For example, data collected in chapters 4 and 5 demonstrated that HR recruiting managers sometimes lack knowledge concerning the technical value of specific industrial certifications. This leads to the decision-maker potentially undermining the benefit of incorporating this knowledge within company processes. Suppose all stakeholders, however, are transparently involved in the process, and there are high psychological safety levels in feedback loops. In that case, more knowledgeable technical staff will likely highlight the value of accreditation knowledge to decision-making managers.

Another example demonstrating the benefit of sharing knowledge is Handler (2013) stated that 24% of IT projects were unsuccessful because of a mismatch between user requirements and developed software functionality. Handler's mismatches in the IT development domain could be mitigated if there is continued interaction between stakeholders and data is effectively collected and disseminated between all stakeholders, demonstrating a crowdsourcing mindset.

This fact consolidated when capturing ethnographic data (see Chapter 4); the researcher found several examples of job adverts that raise considerable mismatches between the job Title advert and the described requirement, in other words, knowledge error (see Table 6.2, Figure 6.3, 6.4). The three examples demonstrate a contradictory knowledge required in the job advertisement. The contradiction explained in detail when critiquing the job section 6.5.2 "Interpretation and critiquing the job description" concerns two knowledge in frameworks that do not fit in the actual work environment, such as ITIL and Agile. The role is IT service management, where ITIL is a detail-generalised practice compared to Agile as a flexible environment. The two frameworks do not fit with each other. Same as PRINCE2 and PMP, both are project management frameworks, and the two knowledge does not work with each other as the philosophical approach is different.

*Table 6.1 Job description example - essential and preferred technical skills/knowledge*

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Essential: Able to design, deploy, implement, and manage; Microsoft Teams; Microsoft Phone System / Business Voice / direct routing Microsoft Office 365 suite: Exchange online, SharePoint, OneDrive Active Directory

Experience in: Windows Server 2016 / 2019; PowerShell; File, Print, IIS and general server technology experience; Azure AD Sync and ADFS authentications methods including MFA; DNS - external and internal

Preferred: MCSA, MCSE or other relevant MS Certifications; Intune experience; Knowledge of the Azure Platform; Understanding of networking concepts: VLANs, QoS, Spanning tree, trunking; Experience in working with Gamma Solutions; **Experience of Microsoft Dynamics; ITIL or Prince2 qualification**

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In table 6.1, the recruiter has asked, as a preferred skill, 'ITIL or PRINCE2' - however, these accreditations do not directly have anything to do with each other.

The Information Technology Infrastructure Library (ITIL®) is a set of best practices designed to describe common approaches that IT service management (ITSM) can take to align IT services with business needs and deliver value to the organisation.

PRINCE2®, or 'Projects IN Controlled Environments' certification, is a process-based project management method that offers a systematic approach to delivering a successful project with clear templates, processes, and steps. Both certifications include consideration of process and project elements, yet the two standards are normally required for different stakeholder roles; since ITIL is the de facto framework for IT service management, and PRINCE2 is the de facto framework for project management. Including both in a single job description raises questions about the scope of the role and the employer's expectations.

This kind of issue could be eliminated by multiple stakeholders interacting; because someone who appreciates the role conflict between ITIL and PRINCE2 would be able to highlight this point (becoming a whistle-blower or process moderator) in order to educate the decision-makers and improve the chance that the job description and role requirements match.

A similar issue could be raised concerning the statement 'experience of Microsoft Dynamics' since MS Dynamics has many versions, modules, and bolt-on components. Suppose the employer wants someone with knowledge of programming core ERP module customisation, yet the candidate has experience using CRM. In that case, the candidate, despite having – from their perspective - 'experience of Microsoft Dynamics', does not have relevant or useful context in the context of the job role. As such, detail is required within the job description to remove ambiguity and confusion.



The researcher proposes a new iterative approach to developing job role descriptions and advertisements, applying Nonaka and Takeuchi's approach and incorporating chapters 4 and 5 research outcomes. It is clear that i) interaction is key to eliminating errors, and 2) all stakeholders are engaged in the process because they are the beneficiary.

However, it is essential to clarify that Nonaka and Takeuchi's approach is not only the four phases of knowledge transfer, i.e., Socialisation, Externalisation, Combination and Internalisation, but an entire system, including management approaches, and the principles and methods behind the system.

The traditional employment system is a structured series of sequential top-down steps, i.e., the employer advertises the job, the applicant applies, and the manager chooses, with the choice often based on either vague or subjective criteria, unverified role expectations, character preferences, and gut feelings. In the Nonaka and Takeuchi approach, if adopted in the employment selection domain, the middle-up-down recruiter aims to interact with job seekers to gain knowledge and draft the perfect job description. This principle of interactive development eases multiple issues considered in chapters 4 and 5 and should act as a core theory and principle of the developed system. For this reason, the study considers the Nonaka and Takeuchi approach as the DSR solution and will become the kernel theory (as required in Design Science). It is worth bearing in mind, however, that all Kernel theory must rely on ideas employed in other domains which have been adequately applied, tested, modified, and extended through the researcher's experience, creativity, intuition, and problem-solving (Walls et al. 1992; Markus et al. 2002).

Suppose, for example, someone provides feedback that the job description might attract a high number of applicants – thus increasing the complexity of selection. Although a mechanism will be explained in detail within the Rigor cycle, in principle, it might be decided (because of feedback and interaction from stakeholders) to develop and use a computer form to ease interaction with the stakeholders. High-tech companies widely use forms to interact with end-users to discover new computer issues and gain new knowledge, like Microsoft.

The corporation managers must appreciate that they are given authority, yet this is given to serve the system; by effectively harvesting knowledge via research and utilizing employee knowledge to maximise the benefit and value created for the corporation. Managers must not be allowed to exploit the system based on subjective preference, as demonstrated by Broadbridge (2004) in the employment domains. Encouraging a bidirectional interaction with all relevant stakeholders (experts and job seekers) allows the manager to enhance their understanding of what skills could help the new role.

Akhavan (2005) highlighted that management support is essential to harvest knowledge in the company process or obtain knowledge by hiring the best candidates. Therefore, management should understand the value of an explicit system that supports continuous iterative interaction and improvement.

Both chapters 4 and 5 demonstrate that the current employment selection system depends on subjective management judgment.

The new system intends to have a more transparent process that requires managers to openly justify both the role description and the selection decision, allowing stakeholders (for example, a job seeker or shareholder) to understand the reasoning/mapping behind the justified role and the decision outcome; and that this reasoning is true when compared to clear pre-define objective SMART criteria. Such a system would refute Michel Foucault's philosophy regarding power and truth, i.e., that the truth is what the person in power says it is. For example, the best-selected candidate may be someone the manager dislikes (Winninger, 1996). Management might want to hire someone else due to hidden factors, yet such activity needs to be openly highlighted and questioned for the occurrence of bias.

If the owner of a private company wishes to hire someone, the argument is that they should be allowed to spend their own money on whomever they like; however, this is not the case in a public company. A poor decision will negatively impact the company's long-term success, especially if the manager is not the owner and the manager is putting their personal preference in advance of the company benefit – i.e., mock bureaucracy. Suppose the person in power defines a job that is not justified or selects a candidate yet cannot map the candidate's knowledge and experience to the job description. In that case, it is appropriate that (within an open system) HR checks should raise questions.

Arijitsatien and Ractham (2017) examine the effect of SECI in Thailand banks using Cronbach's alpha, a method measuring internal variables linked closely in a group or set of items. The method measure reliability, where the validity is measured through content, construct and criterion as an approach in quantitative research. The principal component analysis is used in the study to reduce a large set of data to a smaller one, respecting embedded information in the data that still provides some outcome. This approach was used to assess the study construct validity that measured evidence, content, and the correlation between sentences that dragged from socialisation, externalisation combination and internalisation, which is an approach to ensure that the questionnaire is fit for use and purpose.

The criterion validity is assessed through co-efficiency in regression analysis, a method of accessing the relationships between a dependent variable and one or more independent variables that cannot be changed due to other variables' effects. The study concludes that there is positive relation to business process performance. Also, it positively relates to intellectual capital performance, which matches the employment selection process. Also, there is positive relation to employee performance and other findings that did not correlate with this study. The critical factor in this study is the correlation between intellectual capital performance and employment selection. Several scholars have developed a different framework to support this kind of interaction using the SECI model (Rehman, 2013; Finley, 2013); et cetera, yet detail is still missing.

Accordingly, technology can link stakeholder groups by facilitating communication, interaction, filtration, and dissemination of knowledge/findings. If someone observes an inaccuracy in a job description, as highlighted in the example "ITIL or Prince2 qualification, " feedback allows clarification and

correction of the job description or requirement. Adopting technology and science to facilitate communication, interaction, filtration, and dissemination of knowledge appears not only to be a feasible solution but arguably advisable i) because multiple studies recommend the use of technology, ii) because the use of technology has been tested, and shown to be successful, and iii) because technology, due to its objective, codified, and repeatable nature, solves many subjectivity/bias issues discovered within chapters 4 and 5. Since the characteristics and philosophy behind design science are pragmatic, we must consider an outcome acceptable if it appears to work!

To the best of our knowledge, no research has explicitly considered and developed a detailed process to integrate the SECI approach in the domain of hiring selection. Therefore, incorporating the SECI approach and integrating wisdom from crowdsourcing and the use of feedback to develop a system that adopts knowledge management principles in the selection process adds considerable value, particularly when compared to the traditional processes that rely on a subjective top-down interpretation of knowledge from CV and interviews.

## 6.4 Extending the SECI Framework

In this section, the researcher proposes how SECI can be extended to support either manual or automatic applications. Since SECI divides knowledge into four quadrants - Socialisation, Externalisation, Combination, and Internalisation - all known human knowledge should fit under the four phases.

Accordingly, for the sake of description, the researcher will divide and categorise CV knowledge into four parts as a way of standardised CV- with knowledge in the CV fits under Socialisation, Externalisation, Combination, and Internalisation where tacit or explicit, teachable or non-teachable, subjective or objective to the subject, verified or unverified knowledge representation, such parameters employed in knowledge codification. (See, Davenport and Prusak, 1998; Zander and Kogut, 1992; Sorensen and Lundh-Snis, 2001; Baumard, 1999).

Nonaka and Takeuchi's approach (1995), which adopts dual-loop interaction, has proven to be viable for knowledge creation and transformation. Thus, it supports the process of converting implicit knowledge into explicit knowledge and conversion of explicit knowledge into process change and organisational value. Hence, codification and verification of this knowledge become explicit and observed in practice by several participants and different specialists.

Nonaka and Takeuchi demonstrated that socialisation lies in people's engagement and interaction in different formats. The approach of freely sharing, critiquing, and explaining each other's views helps develop, clarify, and solve corporate problems by harvesting tacit information about other individuals' views. Externalisation occurs when this interaction articulates a problem, converts the knowledge to a process, and later shares it through documentation to solve a future problem. So, in this externalisation phase, the information becomes knowledge converted from implicit to explicit. Interestingly, the information that was circulated in the socialisation phase could be subjective or opinionated in nature (with

different stakeholders reaching a different interpretation). It is also possible that individuals may misunderstand and misinterpret this information. This misunderstanding is exposed in the second phase, Externalisation, as all stakeholders should agree on the final explicit form of knowledge. Combination occurs when we generalise principles from practice and explicitly document knowledge as new or adapted principles and processes. Thus, every person who engages in these processes understands and digests this knowledge by employing it in the work domain. Accordingly, the outcome of knowledge in this phase is explicit and verifiable.

Internalisation is the continuous education of all employees, for example, explaining the value of new knowledge to employees so that the application of the knowledge is considered standard practice.

Nonaka and Takeuchi's (1995) integrated and expanded on Michael Polanyi's work regarding tacit knowledge in 1958 and how this kind of knowledge could make a difference and fetch success to Japanese organisations. According to Polanyi, tacit knowledge is a kind of knowledge developed by a dwelling, which is knowing to do a task efficiently because all the knower senses are automatically engaged in this task (Polanyi, 1966). This engagement and efficiency development are unknown to the knower but automatically kicked into the human system without awareness. As demonstrated in section 5.5.2, the second Relevance Cycle, DSR, Polanyi provided several simple and complex examples; suppose someone is hammering a nail all day working as a builder. This person learns how to hammer the nail and make it fit in one strike because the hit focuses on the nail centre with vertical power and precise force. The precise forces came from the muscles, where striking the centre of the nail engaged accurate measurement and eye. Those automatic calculations happen without builder awareness. The builder is almost impossible to know or can explain how he managed this task and explain it to a novice. The point mentioned by Polanyi is essential as a dwelling develops knowledge. Unfortunately, Nonaka and Takeuchi expressed a different opinion on this fact and stated in the Knowledge creation company that tacit knowledge is hard to codify to know compared to Polanyi that it is impossible to codify, which is a paradox in the meaning between Polanyi's book on the tacit dimension and "The knowledge creation company book". The logical fact is that tacit knowledge is hard to codify to the knower but easy to codify when employing technology or specialist that can interpret the action scientifically. The paradox in this gap grew bigger when some scholars stated that tacit knowledge is impossible to codify, for example (Saviotti, 1998; Leonard and Sensiper, 1998; Szulanski, 1996; Cowan et al., 2000). So, the literature on tacit codification is fluctuated between impossible, posable and hard to codify, whereas the fact **is hard to codify to the knower**.

Nonaka and Takeuchi develop an interactive approach to harvest this knowledge by letting the participant dwell in this knowledge. Later the two scholars suggest another phase to codify this knowledge. Then a circular approach is to continue dwelling in this tacit knowledge and codify it because it has value and high reflection. When comparing Polanyi's (1958) positions to Nonaka and Takeuchi's (1995),

both have slightly different perspectives on tacit knowledge. However, both views could codify tacit knowledge through interaction, engagement, or dwelling.

Nevertheless, it is not the only way to harvest tacit knowledge, but a specialist engagement could articulate and codify this knowledge, which is a crucial point this study highlights. Hence, when participants have the same knowledge, the interaction alone will not codify every bit of the critical implicit information available. The study seeks to employ the interaction principle in an even broader approach than Nonaka and Takeuchi, which is a closed circle of people with no boundaries working together; in this way, the process becomes explicit where the contributors could spot any issue due to bias in the process. In the case of CV, the codification is much easier due to the point system, so anyone who spots an issue due to the explicit codify system could highlight it. This will be explained in detail next section under CV codification and classification. The study approach uses technology as boundary elimination and engages everyone. Hence, codification and verification of this knowledge become explicit and observed by several participants and different specialists. To conclude this argument, the blind can lead the blind and move safer; however, if both get help from someone who can see and explain the road, this has better value.

This element will be discussed later in more detail, nevertheless highlighting the idea by dropping the seeds and later cementing the engagement with the detailed text when addressing the point; this approach activates retrieving theory for the reader.

The approach mentioned above mirrors the Microsoft interaction page, where people engaged with each other due to the Microsoft Windows problem, and then Microsoft representatives engaged when needed. In this way, people help each other and gain knowledge, but knowledgeable people interact and end the matter when too much confusion happens to fix the issue in Windows. Also, Microsoft employees gain knowledge of Windows problems when Windows forms interact with different applications or compilers.

To summarise this section in brief, Nonaka and Takeuchi demonstrated that socialisation lies in people's engagement and interaction in different formats. The approach of freely sharing, critiquing, and explaining each other's views helps develop, clarify, and solve corporate problems by harvesting tacit information about other individuals' views. Externalisation is when this interaction articulates a problem, converts the knowledge to a process, and later shares it through documentation to solve a future problem. So, in this phase, the information becomes knowledge converted from implicit to explicit. Consequently, the information circulated in the socialisation phase could be subjective and opinionated with a different view until all parties agree, so it becomes knowledge. However, individuals could misunderstand this information, which is exposed in the second phase, Externalisation. This thesis appreciated both types of knowledge, explicit and tacit, in all phases because both tacit and explicit knowledge differs according to the phase it appeared in, so it could be subjective or objective, verified

or not verified. In other words, the study considered the wisdom developed in those phases and applied those types of knowledge in hiring or the employment selection process concerning the problem discovered in chapter four. According to Nonaka and Takeuchi, the first two phases lie with the value of knowledge sharing, converting and verifying this knowledge; furthermore, this knowledge has endless sources. The information obtained by individuals is verified through interaction, so it is indirectly verified and becomes validated knowledge; bear in mind that there are several principles in this cycle, including the management behaviours approaches, et cetera. The combination lies when we generalise principles from practice and explicitly written steps, the new principle and approach that becomes wisdom written explicitly. Thus, every person who engages in this process understands and digests the benefits of this knowledge, employing it in the work domain. So, the outcome nature of this knowledge in this phase is explicit and verifiable, never subjective to the environment, but a plethora of evidence exists to confirm this knowledge has value and then converted to explicit, so everyone benefits from it Nonaka, Takeuchi (1995).

Internalisation lies in a continuous education approach to all employees, explaining this knowledge to employees and teaching them the knowledge that has been verified and explicitly exists to benefit both the company and the employee. Otherwise, why is it there? So, the continued teaching approach is another wisdom from Nonaka and Takeuchi. Those two phrases have objective knowledge with apparent value and meaning to the company, explicitly documented and verified. This study considers the four stages in every employment step and employs those steps and the profound meaning and benefit of those SECI phases in each step to categorise and classify knowledge.

This study accepted the four stages of knowledge and their nature, implicit and explicit, subjective or objective, teachable or non-teachable, and verifiable or non-verifiable source, then included them in the employment selection domain. The author divided the knowledge that the company should harvest according to the SECI and Iteratively employs those stages in the employment selection process concerning a modification to fit the environment. This modification is expressed in the next section because of the SECI built for a corporation's processes. In contrast, this study employs SECI with modifications outside and inside the corporation; some contributors or actors are temporary. This modification will fit under the Rigor cycle concerning design science because it will add rigour to the design.

The diagram below, figure 6.2, demonstrates the four-phase of the SECI with knowledge nature in each phase.

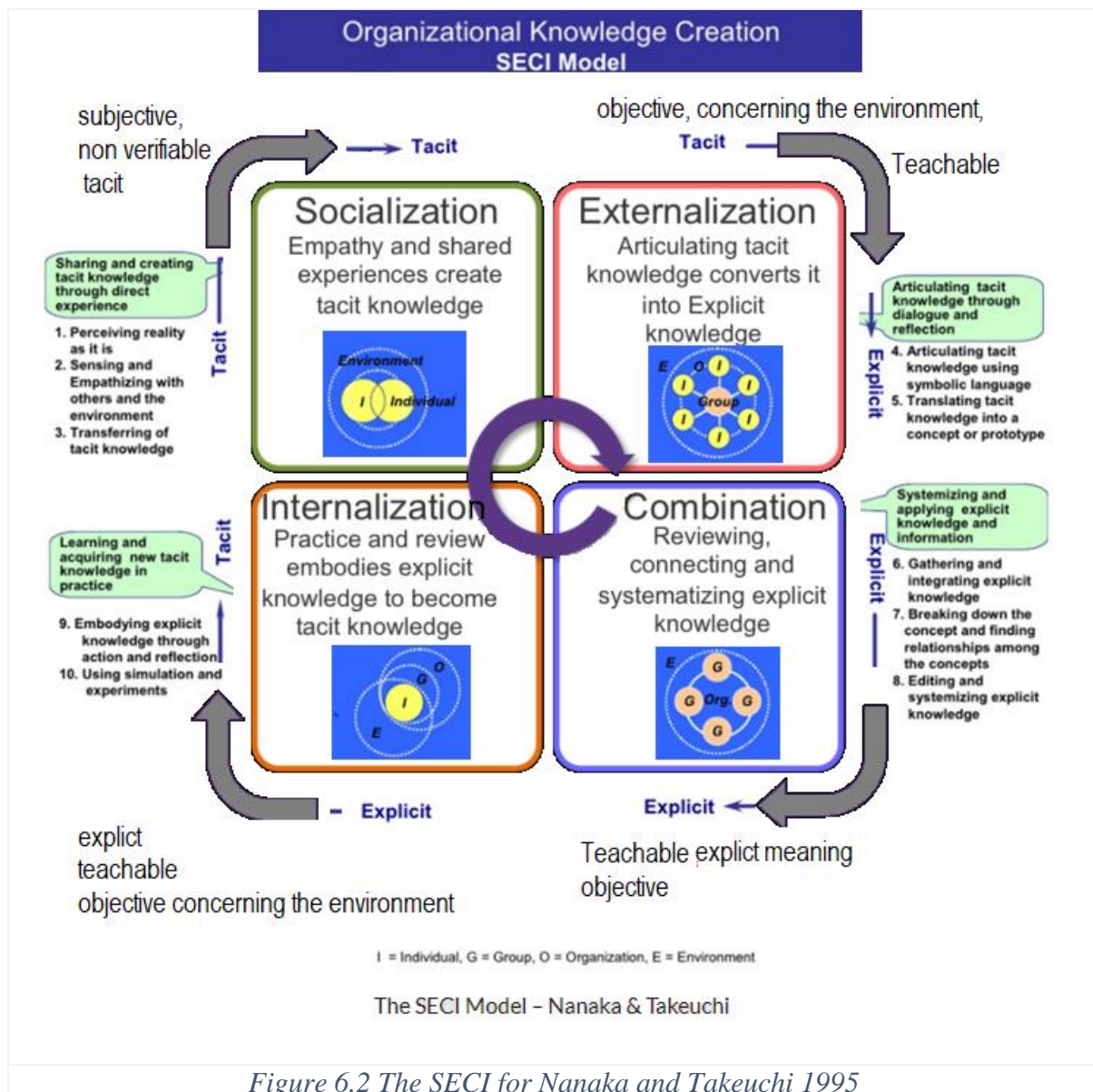


Figure 6.2 The SECI for Nanaka and Takeuchi 1995

To sum up, this section agreed that SECI is the recommended solution to codify knowledge, according to many studies shown in the past chapter. However, the detail is yet to reveal how this could be employed in the hiring domain where some of the actors involved in the system are temporary, compared to SECI, designed to harvest knowledge inside the corporation process. This will be demonstrated in the Rigor cycle to add rigour to the design.

This thesis tries to appreciate knowledge considered in the context of all phases of the SECI within Arther's (2006) employment selection life cycle. For example, the combination and Internalisation phases involve objective knowledge - explicitly documented and verified - which has a clear value and meaning to the company. In other words, the study considers best practices at all phases and applies knowledge to the employment selection process to address the bias problems discovered in chapters 4 and 5.

## 6.5 The Rigor cycle

### 6.5.1 Introduction

According to Hevner, rigour expresses how research develops and impacts the artefact. The foundation for the design cycle also offers past knowledge and experience regarding the project, i.e., from the literature, to ensure artefact innovation. Although Lee (1999) demonstrated that rigour in behavioural information systems could reduce relevance, behavioural information research must combine rigour and relevance (Applegate, 1999)

In this section, the researcher introduces a 5-stage method to consider relevant knowledge management adaptation in the new design artefacts. Stages are adapted from Arthur (2006) and include: i) writing the job description, ii) Advertising the job description, iii) considering the point system, iv) Selection of the candidate, and v) declaring the chosen candidate. This cycle of steps, and the application of SECI within each step, is the Kernel theory and therefore represents the groundwork of the DSR artefact design. The Kernel theory is the core theory that guides the design and becomes the backbone of the design.

Accordingly, to eliminate subjectivity using Nonaka and Takeuchi's approach (i.e., SECI) by abstracting and generalising the entire process in the Rigor cycle, we need to consider how to adopt SECI in the employment domain. To achieve this, as drawn from both the first and second Relevance Cycles (see chapters 4 and 5, respectively), the process needs to:

1. Merge SECI with the stages found in chapters 4 and 5, i.e., writing the job description, advertising the job, point system, second selection stage, and decision making.
2. Draft the job description, supported by SECI, where the four-phase help build a correct explicit and clear job description (because the knowledge in each phase has a specific characteristic and interaction).
3. Draft the CV and list the knowledge according to SECI. Each phase has different knowledge characteristics, as the knowledge in each SECI phase differs.

Accordingly, the researcher divides CV knowledge across the four phases of the SECI approach, as each bit of knowledge should fit within the appropriate phases. Thus, SECI could facilitate CV modification to capture relevant work and non-work knowledge.

4. According to Nonaka and Takeuchi (1995), stakeholder feedback and interaction concerning required job roles, and iterative correction, are beneficial since the interaction of stakeholders can significantly mitigate several bias issues. Amending and correcting the job description using SECI feedback loops would allow the company to develop an explicit advertisement without hidden factors or wrong knowledge, as suggested in chapters 4 and 5.
5. Consider the point system and integrate it with SECI stages to expose stakeholders that attempt to abuse the point system.



6. Select the candidate in the first stage, i.e., after meticulous examination, and apply point system criteria as part of the second stage.
7. Verify the top-scored candidate and decide.

The following section provides a detailed description of the process according to the principle, philosophies, and approaches considered within SECI.

The principle used to merge SECI with Author life cycle is as follows:

The design science cycle called the Rigor cycle, aims to answer how to adopt The knowledge -creation company ideology, principle and philosophy (SECI) in the employment domain. Therefore, quick background to the past study is essential to develop a comprehensive understanding of the research after defining SECI phases and how they fit together.

The study evaluated what kind of human knowledge could impact the employment selection process and divided this knowledge according to the four phases of the SECI, as each phase holds a different kind of knowledge.

For example, the wisdom of internalisation is an explicit knowledge taught and helps the managers and personnel to employ this wisdom collected from the outcome of the interaction, so the study classified this knowledge according to the source of the knowledge, the subjectivity or objectivity of the knowledge, verifiable or not, concerning teachability, and used it in the employment hiring domain. This kind of knowledge that fits under internalization lies under a degree education program. The reason is that a degree education program teaches people explicit knowledge with clear sources, verified and objective to the environment. Also, implicit knowledge is embodied in the program, including practical and theoretical. Then converted to implicit, through teachability; this is the nature of education programs has embedded and explicit meaning. Please view the SECI figure 6.2. For example, computer science programs teach students programming languages to become programmers. However, there is an implicit meaning in such a program: the theory of Algorithmic thinking and Computational thinking; sometimes, those theories have more value than the practical program, which is coding or programming. For example, in 2017, the Trump administration invested 200 million dollars in STEM education, including computational thinking (Romm, 2017); computational thinking is a theory developed through programming Wing (2017); thus, embedded knowledge has value more than explicit knowledge.

This study converts the knowledge from each phase in a similar vein and then considers it in the four phases to build the new proposed system. The detail of converting knowledge to match the employment selection process explained under each phase merged with each stage in the employment selection process.

The proposed system that adds rigour to the design depends on three methods besides the wisdom gained from the first two cycles and a thorough examination of the literature reviews.

**The main methods, points and theories that pulled the researcher's attention and became the pillars of the proposed system are:**

**First**, in *The Republic*, Socrates argues that knowledge is higher than experience, as experience could be positive or negative, whereas knowledge is positive, true, tested, subjective or objective (Plato, 1943).

The literature review demonstrates that a plethora of evidence supports Plato's argument. The most important is knowledge because it makes wisdom. Bear in mind that knowledge could be generated from information through data to create wisdom; additionally, the experience could develop knowledge, or any other means could develop knowledge; this argument is supported by (Chapters 4 and 5).

The different “knowing” developed through experiences is not necessarily tested from all directions compared to “knowledge”. For example, a hobbyist with private pilot certification knows the way from Heathrow to Gatwick; in comparison, a Commercial pilot licence knows the best way concerning fuel, level, altitude, turbulence, radars, et cetera.

**Second**, the computational thinking methods as a way of abstraction, logical reasoning, decomposition, algorithms, generalisation and evaluation. This method helps the author employ logical reasoning and divide it into sections to solve the problem. In this case, the author divided the problematics stages according to biases to higher philosophy, hiring methods, decision-maker, selection of the candidate, and comparing knowledge. So, we eliminate subjectivity using Nonaka and Takeuchi's approach (SECI) by decomposition, abstracting and generalising the entire process. Bear in mind that the SECI is not only the four-phased approach employed in the knowledge-creating company but includes several details such as management approach and behaviours, structure, philosophy, et cetera.

**Third**, the SECI model was developed by Ikujiro Nonaka and Hirotaka Takeuchi in his book *Knowledge Creation Company* around 1995. This book demonstrates the main points that drive the success of the Japanese company. In turn, many executives took the trip to Japan as a pilgrimage to learn the success story. The SECI illustrated the four main aspects of knowledge and knowledge creation. Those aspects are employed as a guideline for job creation and CV scoring.

The SECI illustrated the circle of knowledge developments and how it depends on the transfer of knowledge; this includes the status of the knowledge in each phase and management behaviours, approach and structure to harvest this knowledge. Therefore, the new evaluation considers the SECI with slight modification as the central aspect of hiring and evaluating new candidates and the point system as a way that people suggest. Moreover, the SECI, in this way, considers a meritocracy system, which is in line with Socrates' arguments in the *Republic* publication.

Again as stated before, to remove the ambiguity of codification and to emphasise the point, Scholars argue to explain the knowledge codification into information differently (See Davenport and Prusak's 1998; Baumard, 1999; Sorensen and Lundh-Snis, 2001)

This Chapter adopts the Davenport definition, so codification means automation involved technology, explicit process, or converting the task to explicit.

Finally, this process aligns with a giant corporation with public shareholders and public interest, Not SME companies, because most of the time, they are family-running businesses. The process listed below will not fit the domain of SME because the SECI only fits in intensive knowledge organisations and giant corporations like Toyota.

**The section below is more likely to help practitioners understand and adopt the modified SECI merged with crowdsourcing and wisdom developed from past studies like chapters 4 and 5.**

To recap the important points.

1. Chapter 4,5 studies concluded that knowledge is the key to removing subjectivity from different hiring philosophies.
2. The hiring methods become explicit and monitored by stakeholders, so they become the whistle-blowers in the system.
3. Standardised CV by classifying CV knowledge according to "SECI". So, the knowledge could be tacit-subjective-verified-teachable to the environment or tacit-objective-verified-teachable to the environment; otherwise, it could be explicit-subjective-unverified sources to the environment or explicit-objective to the environment, et cetera.
  - A. This includes tacit knowledge and a process to codify CV knowledge; the detailed description is below. Remember that the SECI phase has a different status of knowledge according to each phase, whether **subjective or objective, explicit or implicit, verified or not**, as those critical factors in dividing CV knowledge according to those parameters.
  - B. The explicit knowledge codification in CV and sharing mechanism to benefit from this knowledge.
6. A point system is a way to calculate and assess knowledge, which could be configured according to the need.
7. The job description is not fixed and is advertised in a public forum where a job seeker can interact with the Job and comment under the job description. The job owner's responsibilities are to engage with the stakeholder and act accordingly. The detail will be explained in each phase next section.
8. Explicit adaptations to the interview: The interview process is explicit and recorded and then shared with all stakeholders so that the interaction will uncover bias. The process should respect human privacy by anonymous the phase while sharing it publicly.
9. The interviewer becomes an assurance mechanism for the point system and ensures it is applied correctly. With no biases, the interviewers verify there is no misrepresentation or any gap, and the one with the higher score gets the Job.

10. The score is listed explicitly, and the job owner should engage with any objection.
11. Third-party monitored the process, for example, a small employment law firm that benefits from bias cases if they exist.
12. This is only a suggestion out of a study scope. The company can provide knowledge certification to each worker with an explicit end-of-year employment record. The employee has the right to respond and uncover bias in evaluating the performance. Again this process should be explicit and monitored by a third party through the same public forum; the report owners have the right to share or unshare the file.

Below is a detailed description of the process according to the principle, philosophy, and approach of the knowledge-creation company by Nonaka and Takeuchi (SECI), including Arthur's (2006) steps in employment selection

### 6.5.2 (Stage 1) Writing the Job description

Writing the job description is the first step being considered; accordingly, the manager should list the knowledge that the manager believes to be helpful for the role, and managers should classify the knowledge into relevant SECI phases.

This step is often achieved by managers comparing what the company have in a past role. However, this process requires research and study of the environment and assessing what could help as new knowledge or sciences exist to support the environment further.

#### The challenge

When writing the job description, it is worth highlighting that only practical or theoretical knowledge parameters are used in this selection; although managers are most likely trying to hire the best person, it is critical, in order to avoid bias, that selection focuses on candidate knowledge over and above other properties because knowledge is what matter to the corporation, (Georgakakis, Greve and Ruigrok, 2018) - as described in chapter 5.

If this point is not enforced, a manager may choose to configure the role to either i) fit a friend or person already known to them or ii) configure the role to match the characteristics of the previous employees who filled this role. Also, it is possible that the recruiting managers may not be an expert in the subject and may have a knowledge gap.

When knowledge decreases, bias tends to increase (Chapin, 2009). Accordingly, if knowledge is not the focus of the job description, the first draft is likely to contain numerous errors or issues, any of which could limit (due to bias) the corporation's ability to identify the best candidate. Accordingly, the use of SECI is encouraged to help develop an explicit system; the four stages help develop interaction and give managers the information they need to correct their errors/mistakes.

## Writing the Job Description

The first step of the employment selection stage, as proposed by Arthur (2006), is writing the job description. The researcher suggests dividing the job description and the process of writing the Job description in line with the SECI phases, i.e., "socialisation", "externalisation", "combination", and "internalisation". Each step in the SECI knowledge creation approach represents a specific knowledge and conversion characteristic humans could own. The SECI also provides a structure to separate the hiring stages for the employment selection process. Ideally, when employing computational thinking and decomposition in computational thinking and information gained from chapter 4, it is logical to divide the CV according to SECI to standardise CV as scholars recommend standardization to overcome bias see (Woodford, Wordsworth, Malinen, 2022).

This process helps to classify the knowledge required for the new role in line with the SECI phase since knowledge at each phase, due to its nature, has a specific set of pre-defined characteristics, tacit or explicit, subjective or objective, peer review or opinionated. Therefore, if the job description is written with lots of errors or contradictory requirements, the interaction between stakeholders will help expose these errors and clarify potential conflicts and points of vagueness, as highlighted in the ITIL or PRINCE and MS Dynamic examples expounded in section 6.3.

Therefore, all stakeholders' conversations about the job description should be open, transparent, and explicit through SECI phases. Socialisation allows people to observe the discussion, comment openly on the job description content, and add feedback concerning possible bias. Then document the discussion, amend the job through SECI phases to get the final job detail, and match the CV according to the final job detail outcome.

The literature review, and data collection in chapter 4, highlighted a plethora of evidence demonstrating that job descriptions can contain several technical errors and black holes. Once a recruiter or company HR lists the initial job description on a website, in line with socialisation, there may be a discussion forum (or form) under the job description where people can give feedback (or interact) with the employer to highlight possible technical errors and gain clarification on any points. Within the proposed SECI solution, the job owner is responsible for maintaining feedback, addressing queries, and openly answering questions. Also, when someone has crucial knowledge concerning the Job, they can openly argue for iterative consideration in the job description. Inclusion of this stage allows the highlighting of errors in the job description and mitigates biases when a job description poorly aligns with non-essential candidate characteristics yet ignores knowledge points.

At this stage, the aim is to spot knowledge error representation; literature called it an imaginary requirement, as demonstrated by the three examples below.



Posted 04 April, 2023

IT Service Manager - ITIL

Sanderson Recruitment

Kingston upon Hull, England, gb
Full Time

IT Service Manager Duration- 6 Months initial Rate- £ market rate to umbrella Location - Local Office twice a week We're looking for a robust Supplier Manager to join a financial services company. The person that they're looking for must have a strong background in IT Governance, Audit and Regulatory actions as well as a strong service management background. Must have Agile and Waterfall project... To view the full job details please click apply.

APPLY TO THIS JOB

This is an ITIL Service Manager role, which means applying the ITIL process in managing services why they need agile and waterfall project management. The question has the one who wrote this job read the ITIL manual?

*Figure 6.4 Additional examples of job description errors.*

## Interpretation and critiquing of the job description

While reading the job description presented in Figure 6.3, the role title, i.e., project manager, is explicitly clear; however, the description's detail concerning what methods they hope to use is absent.

If project managers do not plan to use any methods, then this project will most likely be in a state of chaos. The description states explicitly that ‘the candidate should have demonstrable experience of delivering high-quality project documentation’ suggesting a structured approach, such as PRINCE2, yet the description also mentions ‘RAD logs’, which suggests a focus on the use of agile approaches.

This role (see Figure 6.3) relates to project management, but the job description seems to highlight the technical aspects of the role. According to project management methods, the project manager is responsible for managing the technical aspect, yet commonly it is not critically essential for the project manager to be an IT expert. So, why does the job description focus so much on the technical aspects of the role?

This is an area that would benefit from some clarification. Moreover, what certification is required for the role? Currently, no accreditation is mentioned in the job description. What is project governance involved in this role? Does the project manager have to have PMP certification? Do project managers need to understand cloud migration or detail consulted with the technical managers? Or is the role regarding understanding the change management process? For each of these questions, some additional description or clarification concerning employer expectations would help potential job seekers to know whether they believe they can meet the employer’s needs – saving both stakeholders considerable time and effort processing doomed job applications to failure.

This job description example (see figure 6.3) is vague and open to confusion and speculation; and strongly implies that the person who wrote the job description (i.e., the job owner) does not fully understand the specifics of the role. Alternatively, it is possible that the firm already has someone in mind, i.e., "whom you know, not what you know" (Broadbridge, 2004); yet the company is required to release a public job description as a legal requirement.

The researcher made several attempts to speak with this specific recruiter, i.e., to gain more information regarding the job description. However, this request could not be made on an open and accountable forum, and (possibly due to the top-down nature of current employment selection processes) recruiters choose, without consequence, not to respond to the messages.

The top-down approach mentioned above that lacks interaction and unwillingness to speak to someone showing genuine interest in the job description is not a good sign. Despite the job title, the job description suggests a considerable focus on change management.

The knowledge required to support effective management change is ITIL service transition, which supports change management, transition planning and support, release and deployment management, service asset and configuration management, the ability to contribute to knowledge management and store information in a database, service validation and testing, and change evaluation; yet limited clarification information is given.

Suppose the job required a project manager to manage the rehearsing testing phase. In that case, the business world needs to ensure that the candidate knows about operation management. Suppose the job is smaller and only needs someone in the release and deploy service. Accordingly, the company needs someone who understands how to manage release approaches, such as Big-bang, Phased, push versus pull, manual via automatic, or all of the above. It is even possible that the company may not (in reality) require a Project manager but someone who knows about releasing the plan, policy, package, deployment, and acceptance criteria; none of this information is listed in the job description. This means more applications as job interpretation could be taken in a different direction. Also, this means that candidate selection will not consider such issues in the job interpretation, resulting in a mismatch against needs, the lack of clarity and a mismatch in the description resulting in more subjectivity in understanding the role. This also results in more inappropriate candidates applying to the role, leading to a more complex shortlisting process and more interviews. This process results in more candidates being rejected because everyone interprets the Job according to their possessed knowledge base – i.e., their 'Horizon'. A rejection like this harms the candidate's eventual social status regarding fairness.

## The Socialisation approach when writing the Job Description.

### Stage Aims

In the current phase, the company is drafting the job and listing the knowledge required for the job from their view according to the nature of the knowledge in the SECI, as each phase of the SECI holds a



specific kind of knowledge, implicit or explicit, subjective or objective, and the source of knowledge if credible or uncredible to the environment or subjective or objective to the environment. In this stage, **Socialisation, the nature of the knowledge is tacit and subjective to the environment**, and the source is **uncredited or unverified**. The alternative word to credited is framed or generalised or directly impacts the role of specialised knowledge. For example, PRINCE2 is credited and framed; if the job projects management, this knowledge is objective to the environment. However, in this phase, Socialisation is uncredited, tacit, and subjective.

In the same vein, the knowledge in the CV will be divided into four stages according to the nature of the SECI knowledge; the approach to categorised knowledge in the CV is similar to Braileanu et al. (2020). However, this study used different categorizations according to SECI, so the candidate list in the socialisation section the **tacit-subjective knowledge** that is **unverified**; the CV platform could ease this step.

This section aims to classify the knowledge, specify the amount of tacit knowledge required for the role the company is hiring for, and discover if any candidates own knowledge that is important to the corporation. It also helps remove bias in the new role description when stakeholders aim to cover the gap in the company due to an employee vanishing or a new proposed job.

This stage also helps expose managers' biases by writing the job description to fit friends; suppose biases seeds are implanted in any stage; these seeds will discover in the other stages through the explicit system and monitoring. Furthermore, suppose someone is gifted in a specific section of knowledge. The proposed system aims to spot people with gifted knowledge and put the person in the right position, avoiding someone else being placed in this position due to bias or the wrong routine.

### **Objective**

Filled the aim by defining the knowledge that fits under this section, discovering candidates who could have knowledge that is beneficial to the company, and applying the principle and methods collected from the knowledge-creating company, including management behaviours, approach and guidelines for the SECI. Then four stages employ a point system in each step, and this will be described in the point system to make verification and calculation possible and less biased.

### **Description:**

**The nature of the knowledge is tacit and subjective to the environment, and the source is uncredited or unverified:**

This section deals with the unmeasurable knowledge required for the role that has no clear knowledge database and is yet to be converted to explicit. For example, reading a fiction book creates tacit knowledge with value but not a high value. In contrast, reading peer-reviewed book has a different value and should not be under this section, especially if the knowledge from this book is objective to the environment. However, if the peer-reviewed book contains knowledge that is subjective to the environment or the Job, it should be in this stage. So, both recruiters and job seekers work to codify the

knowledge later, if possible, if this knowledge is essential to the company and the role they are hiring for. For example, a job requires listening to a conversation and identifying the accent of this person.

In this case, the knowledge required for the role could be obtained online or through somewhat a knowledge-based but not authentic, like listening to an accent on youtube. Alternatively, suppose the knowledge obtains from a document written as a manual by a specialist; in such a scenario, this should be in the next stage because the source is objective and authentic to the environment.

The employer should clarify the % of tacit knowledge required in each piece of knowledge the company demand. This step is due to first what is called the google bias, where people start depending on google instead of keeping knowledge in their minds.

For example, if EXCEL is required, the excel course is divided into sections. They can measure the tacit according to these sections, and if it is essential knowledge of the role that should be tested or codified to become explicit, several online tools can do that, so subjectivity is removed gradually.

Remember that wrong information could be placed in non-credit or non-authentic sources. So, people are aware in advance of how much is needed. Suppose the company is looking for X software; so how much must the candidate remember without any knowledge base?

Remember that there are verified knowledge-based forms like Excel run by Microsoft and unverified knowledge-based ones like YouTube and people placing experiences on youtube, or it becomes totally different if Google places knowledge as a youtube channel for Google Sheets. So, the point is verified and trustworthy or not verified.

The point system will be discussed later with the respect that each company could have its own point system, as no point system serves as a panacea or universal solution.

The job description at this point becomes clear and explains the amount of tacit knowledge required compared to explicit knowledge; bear in mind that explicit knowledge has a higher value, and the SECI stages will enlarge this knowledge because of the nature of the four stages. This enlargement works the same as regression analysis when enlarging the distance in the graphics of a dependent and independent variable to demonstrate a larger difference, so it becomes clear.

The other factors, as shown below, are considered tacit, and the candidate only agreed or disagreed with them because quantifying those factors are impossible. Peter Drucker's "what gets measured gets done" is famously known as "If you can't measure it, you can't manage it."

The tacit knowledge also involves the following, so the company should address them and not match them with the candidate, but only accept or reject them, those lists collected from the vast literature and chapter 4 and 5.

- a. Social skills: agreed on social skills policy.

- b. Company culture: agreeing on company culture.
- c. Body language: Some companies reject body language; some accept it depending on the company and area of expertise. For example, the intelligent army considers body language, and there is a consequence if it is positive or negative.
- d. Dress code: The candidate should agree to the dress code because some companies do not tell about it until they are hired, especially when hiring manufacturing leaders or managers.
- e. Input and output, or what call listening and answering. The military runs some companies, and the employees reflect the military approach. So agree on the conversation protocol or management protocol or management methods if they are permissive, persuasive, micro-management or autocratic.
- f. Social class level: Some jobs require a specific social class, and codifying such a task is challenging. However, a credit card budget could be used for codification or past year's tax payment.
- g. The knowledge gained from different spaces includes hobbies, extra reading, life experience, et cetera.

The Job documented all this from the beginning, so people expect what they are going to face and act accordingly. So, supposed a conservative cameraman and agreed to work on TV recording behaviour against that person's ethics. In that case, the cameraperson should know the environment and never mention the philosophical approach adopted, act according to company culture, and only need to be agreeable. Finally, this means the only matter is **objective knowledge** in the domain, and subjective knowledge could be considered in the subjective domain.

## The Externalisation approach when writing the Job description

### The Aim

When writing the job description, the owner needs to divide knowledge into four types according to SECI and write the knowledge detail in each section. Hence, externalisation is an initial requirement by first placing the knowledge that matches the externalisation phase, which is a **tacit objective with a verified source** to the environment or the role. The reason is that knowledge in externalization is focused due to the interaction between the group and then becomes a concept for the position, with a source that is implicit and could be subjective.

This section seeks to segregate knowledge gained through verified knowledge sources like Excel and unverified knowledge sources gained through self-taught or any other ways that are hard to articulate if it is right or wrong.

The nature of knowledge in this section has to have verification ways of its sources or any other means of verification. For example, reading a scholarly book with a clear knowledge source or a book reviewed by several scholars is different when reading a fiction book written by one writer.

The bookstore platform provides a form of a point system in the digital era; after asking questions about the book, and the candidate answers it correctly, this kind of point could be verified.

Another example is that some companies provide work experience certification that is not a trademark certification, i.e. PRINCE2 is considered a trademark certification in comparison to company certification as uncredited, and the program is not precise or scientific, so it is subjective. Remenyi (1999) employs such an approach, subjective and objective, in evaluating. The crucial point is knowledge position; if it is objective or subjective, verified or unverified sources to the environment, in case it is a **tacit objective with a verified source to the environment, it will fit under this section.**

The objectivity developed or added from the first stage, alternatively removed and even converted to explicit or tacit, will be decided through the interaction.

### **The objective**

This section **lists tacit-objective knowledge of the environment.** So people who read 100 books and have good knowledge that could be useful to the corporation must have a credit that segregates them from someone with zero knowledge. The knowledge in this section becomes clear, and when errors are placed in the job description, they can be spotted through interaction. The point system in the coming phase could help clarify this aim by defining the knowledge fit under this section and the point system.

### **Description**

The knowledge in this section is **tacit-objective with a verified source** to the environment or the role. According to SECI, externalisation is **tacit to explicit** conversion, which means the knowledge in this phase is focused and **becomes a concept to the environment**; however, it comes from a tacit unverified source but through experience. Therefore, when trying to adopt this knowledge in the hiring system, we seek knowledge that gains from uncredit **sources** concerning the environment, like books; however, this knowledge remains tacit in the candidate's mind. So the manager list in this section that such knowledge means has the same characteristic and also learns what other bit of knowledge available in the market could be beneficial to the role; this happens in the advertisement stage.

In other words, In this step and supported by the advertisement step (next step), managers who interact with stakeholders understand what knowledge exists in the market that the manager is unaware of beneficial to the role. Also, what knowledge is required for the role could be listed in this section. In addition to error spotting, as described before.

For example, different books explain the IT operation manager position in detail, demonstrating the author's view, so it is tacit and subjective to the environment. Other books are written as manually tested and adopted in several corporations, so this will not fit in this section but in the combination section. Again, **objective or subjective knowledge of the environment, authentic or non-authentic sources,**

and if written as a manual or as a story, it means **subjective or objective to the environment or credible source or un-credibly**. Those parameters make it different, so if it is manually adopted as a work procedure, it will fit under **combination**, not this section. But if it is experienced and demonstrates the author's view and knowledge, it will fit in this section.

The evidence of continuous learning and evidence that the candidate is willing to share knowledge also fits within this section for two reasons. First, the SECI is about sharing knowledge, so some employees do not share knowledge with people who ask them. The data shows that some managers respond, "I will let them think twice before they come to ask me a question." Hence, knowledge awareness companies have a process to reward an employee who contributes to knowledge sharing and converts it to explicit.

The managers look in this section for a candidate willing to share knowledge and convert it to explicit so it becomes a company asset. Second, when candidates read a book and discuss it with the system, they can share this knowledge and writing in the system by answering the questions regarding the knowledge gained; the CV platform could ease this point.

To summarise the above point, this section lists the knowledge required for the role, that is, tacit and **objective with a source that is uncredited to the environment**, as well as the employee's ability to convert Knowledge to explicit. The interaction and the stage of the SECI convert to explicit each important bit of knowledge for the role.

So, in the job description, they should have a section, for example, a book related to the job; they also have the right not to mention books in the job description. However, in both cases, books read by the candidate should be calculated in the point system; for example, if the job is related to the operation, the job seeker should list this information in the profile.

The interaction will falsify and expose any wrong information, so each stage has more than one purpose. First, segregating the knowledge nature according to the stage when writing the job; second, raising awareness of what new knowledge fits in this stage could be beneficial; and third, exposing what could be crucial to the role that is required to be explicit.

Further externalisation concern is recalling in memory; the job description should list how much knowledge is required in the new role. For example, How many roles does the candidate use excel software? So, How much knowledge is required for this Job in specific software or technology, considering retrieval theory (Ratcliff 1978)? So if the knowledge required in the job descriptions is highly dependent on tacit as the system has poor knowledge databases, the candidate should demonstrate using this knowledge in one period after another; this situation is positive. However, this is negative if knowledge is used in one role and ignored in two other roles. Hence, considering retrieval theory, the amount of tacit knowledge in this role, and the specific techniques used. On this basis, evaluating the candidate's knowledge and scoring this section is described in detail in the candidate section.

Again, the SECI will also be used as a standardised approach for CV so that the CV will list the knowledge according to the SECI, so each section contains knowledge that is tacit-subjective or tacit-objective, explicit-subjective, explicit-objective, including the other parameter as listed in the SECI above.

To sum up, this section harvests the tacit information gained from an explicit source and verifies the source if it is a credited or uncredited source. So that this knowledge is fit for use and purpose in the environment. Furthermore, the candidate's sharing capability fit under this section. Again this is never a direct follow-up to SECI but adopts the principle, ideology and nature of knowledge in this phase and uses it in the CV categorisation after merging the SECI with Arthur's (2006) hiring stages.

### **The Combination Approach - writing the Job description.**

The nature of the knowledge in this phase based on the SECI is **explicit to explicit, objective to the environment and becomes accredited to the environment as verified knowledge**. Therefore the knowledge that matches such characteristics is very clear, so adopting this in the writing job description is an easy task. For example, PRINCE2, in the project management domain, this knowledge harvests years of experience to become explicit and objective to the environment with verified source and testing. This knowledge is not opinionated or demonstrates the author's view but methods with a clear success rate.

#### **The Aim**

This section aims to help write the demanded knowledge categorised similarly to such knowledge that matches the above characteristic required for the job; also, the interaction supported by the next stage (advertisement of the role) help discovers knowledge in the market equal to such knowledge. For example, let's assume the manager who is writing the job does not know there is X method that substitutes PRINCE2; the interaction will support the manager in obtaining such information. In addition, the main reason for this step is a suggestion of the knowledge that is required in the job description according to the knowledge in SECI.

**The aim is to identify the candidate's knowledge developed from explicit and verified sources; the recipient's knowledge is verified after the knowledge transfer.**

For example, ITIL certification is knowledge harvested from years of practitioner experience and research and then developed into a trademark framework. So, it is practical knowledge converted to explicit. This kind of knowledge is explicit, and the recipient holds the knowledge as explicit in an open-book format. So any industrial certification fits under this section as it is explicit. However, this does not include academic degrees like BSc or MSc. An education program has an implicit meaning embedded in the recipient's mind and generalised in comparison to credited knowledge; such knowledge fits under internalisation from explicit to tacit.

#### **The objective**

Divided the knowledge into sections and ensure that there are no errors when listing the knowledge required for the role, or even bias, by writing the job according to managers knowing that could have errors. Also, discover new market knowledge when this step is supported by the next step, which is advertising the job that could benefit the company when hiring new candidates for the role due to even employees vanishing or newly created. The new market knowledge discovery could happen through interaction and falsifying wrong information.

Remember that the system should work as a complete system, not each stage itself.

The point system that will be explained later in the point system section will calculate how much knowledge is gained through certification. The job writer will put this in a different section, so matching this requirement is straightforward.

### **Description**

This knowledge is explicit-objective to the environment: Industrial certification is a kind of knowledge developed by people who have a long career in the field or the domains.

This knowledge has been converted from its original form, tacit to explicit, then converted explicitly by another candidate, verifying that the recipient receives the knowledge correctly. This knowledge differs from reading a book and verifying this reading with a few questions with no clear and solid meaning; such a book represents the author's message. However, industrial certification represents programs with a clear outcome and verification of the outcome and recipient. So the program administrator provided the recipient with a certification

### **Internalisation approach - writing the Job description.**

The knowledge in this phase is explicit to implicit, which means knowledge gain is absolutely true; the source is tested and teachable from one to many, so it becomes tacit. The candidate learns it and converts it to implicit, so it is possible to share it with all employees as true knowledge, especially the essential knowledge of the company.

The company shares this knowledge from individual to group as teachable knowledge, which is the only phase that holds such knowledge. When comparing this knowledge to the educational philosophy in this phase, the knowledge transfer is the same as the Essentialism educational philosophy, which focuses on the basics of science and sharing knowledge with all people (Mehmet 2018). The combination is group-to-group teaching, and it is explicit to explicit, so this is the difference and why this paper classified this knowledge as an educational program.

The Internalisation phase in the knowledge creation company aims to teach the employee the basic knowledge needed for the job and transfer it to tacit and embedded in the employee's mind because the other knowledge exists in explicit form. The knowledge in this phase is teachable through simulation and experiments, precisely similar to an education program. Bear in mind this approach develops explicit and implicit knowledge that remains in the human mind for a long time.

This kind of knowledge transfer is supported by the Perennialism philosophy in education, which emphasises the fundamental aspect of science because it lasts forever in the human mind.

This kind of knowledge exists in an educational program because educational programs have explicit and implicit meanings and remain tacit in the candidate holding the fundamental knowledge.

The key point is explicit knowledge, tested, generalised to education level to the company, objective to the environment, that has implicit and explicit meaning, one to many.

This is the outcome of the knowledge in the Internalization as the knowledge is circulated, studied, written and becomes teachable where bits are saved in manual form and others as tacit in the employee's mind. This is the difference compared to the combination as the knowledge is written mean explicitly and remains explicitly to follow through manuals. Finally, this is the only left knowledge that could be existed in the world compared to the three listed knowledge.

### **Aims**

This kind of knowledge fits in an education program like a degree program; the reason is that an education program has a deeper meaning than the material studied in the overall program. For example, Computer science graduates believe they should do a coding or logic gate design. However, there are embedded meanings like algorithmic thinking. So, this fits within explicit to tacit as the programming knowledge verified by sources; the recipient holds this embedded meaning in mind in a tacit format.

### **Objective**

Divided the knowledge into sections and list the knowledge required for the role under this section; learn from the interaction and the next stage ( advertising the job) if there is a new program that could benefit the company further that the company is unaware of such program. Also, falsify wrong information if it existed.

The point system will calculate this knowledge, and the job writer will put this in a different section, so matching this requirement is straightforward.

### **Description**

The internalisation approach is related to the explicit to implicit knowledge conversion, which implies that the gained knowledge gain is tested, structured, yet teachable (one to many), thus allowing it to become tacit in nature. The candidate learns it and converts it to implicit knowledge, so it is possible to share it with all employees.

The company shares this knowledge from individual to group as teachable knowledge, such as in the Essentialism educational philosophy, which believes that teachers should try to embed moral values and virtues, as well as intellectual knowledge, that students need to become model citizens. Such as approach focuses on the basics of sharing knowledge with all people (Mehmet 2018). Accordingly, the Internalisation phase in the knowledge creation companies aims to



teach the employees the basic knowledge needed for the job and support the transference of explicit knowledge to tacit concepts embedded in the employee's mind. Thus, internalisation aims to support the Perennialism philosophy in education, which emphasises the fundamental ‘ideas and concept’ because such knowledge transcends time, is future transferable, and lasts forever in the human mind.

This kind of knowledge exists commonly in educational programmes since educational programmes contain both explicit practice and implicit concepts, which, although tacit in nature, stand as being fundamental to knowledge. Such knowledge incorporates explicit knowledge by disseminating the concepts throughout the organisation as basic norms. Within the combination phase, we aim to document the knowledge as explicit documents and rules. The outcome of the Internalisation phase is the tacit internal integration of this knowledge within the company (via teachable programmes), most importantly, tacitly in the employee's mind, thus resulting in the implicit integration of concepts in business processes, designs, and norms. A degree, for example, which contains much content to support learners to appreciate core concepts and help learners improve how they think about and process information, can be said to include much internalisation material. For example, a computer science graduate should possess practical skills, such as coding or logic gate design; however, a good computing graduate should have also developed a solid tacit appreciation of the ideas and theoretical ideas behind the coding language and design approach, i.e. the recipient holds conceptual knowledge tacitly in their mind. As discussed before, such knowledge supported by computational thinking methods has a higher value. Please see section 6.5.1; the outcome is a job description, the same as figure 6.4; in the same approach, the CV should be standardised using the same approach as the job description where knowledge is categorised according to SECI.

The Socialisation-knowledge required: <a href="#">List the match knowing</a> The Externalisation-knowledge required <a href="#">List the match knowing</a> The Combination-knowledge required <a href="#">List the match knowing</a> The internalisation-knowledge required <a href="#">List the match knowing</a>	The Socialisation-knowledge required: <a href="#">List the match knowing</a> The Externalisation-knowledge required <a href="#">List the match knowing</a> The Combination-knowledge required <a href="#">List the match knowing</a> The internalisation-knowledge required <a href="#">List the match knowing</a>
The Job description	The CV Profile website
<i>Figure 6.5 The outcome of stage one</i>	

### 6.5.3 (Stage 2) Advertising the job according to SECI

#### The Challenges

The second step of the employment selection stage, as proposed by Arthur (2006), is the writing, releasing, and management of the job advertisement. After closing the first phase, the initial job requirements should become apparent, so the 'Advertising the Job' phase requires the company to advertise the job as an initial requirement.

The interaction between stakeholders, as mentioned earlier, is key in the advertisement stage. This interaction is a demonstration of a closed control loop embedded in the SECI; however, to ensure that the loop has an enforcement mechanism, the researcher suggests that one stakeholder should be a third-party employment law firm that can monitor the process, making it very difficult for the hiring company to impose a hidden agenda. If the law firm were to accept cases on a "no win, no fee principle", then any wrongdoing (which is transparent to all stakeholders) could be questioned for legality, and action could be taken.

Interaction between stakeholders serves several purposes: i) managers/recruiters may have limited knowledge of specific courses, books, accreditations, and certifications in the particular domain. The existence of an explicit system of interaction with relevant stakeholders will help remove any confusion held by either the employee or the job seeker and any misrepresentation that might exist in the defined company need or knowledge and accreditation required for the role; ii) the interaction reveals bias and hidden agendas in the job description, which if unmanaged opens the organisation to several harmful complications.

Within the system, any candidate has the right to email the job owner and query details about the role, fix an error in the job description or amend the job description by employing an open and closed-loop process. This process could happen if someone has knowledge that matches the task, yet this knowledge is ignored in the list of the required knowledge or finds a gap in the listed knowledge or requirement. The mentioned change could be supported if the candidate (i.e., the job seeker) demonstrates how this knowledge is essential to the role. This process is a closed loop that potentially impacts the job description. If the case is controversial, the open loop will continue, involving a discussion with HR personnel so that the case could be taken or rejected in a future job. This process aligns with the SECI approach, where a conversation leads to improved information and hopefully results in explicit knowledge and stakeholder agreement. The managers gain knowledge concerning core domain knowledge (which might be new to them or the organisation), and job seekers express their ability to share knowledge and positively elaborate the job description. The company is more likely to find someone who meets the knowledge gap, and all of this is done openly – thus reducing the chance of subjectivity and bias.

Nonaka and Takeuchi (1995) originally suggested that all stakeholders, regardless of position, should be allowed to criticise the process at any time concerning the organisation process. i.e., suggesting full

psychological safety. However, such a system may not work in the West, especially in the USA, where the law supports a “hire at will” policy, and it would not be easy or possible to introduce a legal mechanism of check for subjectivity and bias.

To sum up, the role's Advertisement should consider the four pillars of knowledge (SECI). Remember, the CV should adopt the same pillars, so this fulfilled the CV standardisation. In this stage, errors in job descriptions are spotted, and bias could be spotted if the job is written to match someone and educate the manager on new knowledge that could be beneficial to the corporation.

## Socialisation approach - Advertising the Job

### **Aim**

Harvesting knowledge that matches this phase that the company does not have and incorporating it with company knowledge by hiring a knowledgeable candidate. Also, understanding what other knowledge the company is unaware of could be beneficial to the role. Spots errors in the job description, spot bias and embedded requirements. Finally, spot and understand what can be crucial to the role that is required to become explicit.

### **Objective**

The objective is fulfilled by developing an interactive form that could be used to advertise or write the job description in this form and critique it by stakeholders.

### **Description**

Harvesting information about what knowledge matches a specific job role, especially if the company HR team does not possess much awareness of role details, and incorporating this knowledge within the company hiring process, is critical to ultimately obtaining a knowledgeable candidate. Becoming aware of what knowledge the company is not unaware of is hugely beneficial to both defining the job description and focusing on company learning and development. Moreover, spotting errors in the job description, spotting and highlighting bias in the embedded requirements, and spotting and understanding what knowledge is crucial are important to defining an objective criterion for candidate selection.

The creation of objective knowledge is fulfilled by developing an interactive feedback mechanism, for example, a feedback form or forum, which can be used to question vagueness or error. Implementing this feedback mechanism requires the removal of the attitude that the employer and recruiting managers (who hold the power of decision-making) ultimately ‘know best’, and their actions should not be questioned or challenged. Nonaka and Takeuchi refer to such action with the word “IM”, so it is a common bias approach.

## The Externalisation approach - Advertising the Job

This practice lies when the recruiter interacts, “Answers” the stakeholder, and “**Amends**” the Job accordingly regarding knowledge fit under this section. So, this knowledge is tacit-objective with a

verified source that could benefit the role where stakeholders examine it and ensure it fits for use and purpose.

The interaction loop could take each phase of the knowledge by itself or merge the four-phase; the most important in the Nonaka approach is the free interaction to discover the gap.

### **Aim**

The job owners acknowledge the interaction and amend the Job accordingly, and the recruiter gains broader knowledge than what is in the domain or the bubble around the recruiter.

### **Objective**

The objective is filled through interaction and **modification** to the Job.

### **Description**

Externalisation occurs when the recruiter interacts with, answers stakeholder issues, and potentially amends the job advert accordingly.

Externalisation relates to the transference of tacit knowledge to objective knowledge, i.e., tacit knowledge conceptualised through images or words, in this case, by document themes highlighted as part of a systematic stakeholder feedback loop. Where issues arise, the job owner may acknowledge the interaction and amend the job and advertisement to ensure that the feedback themes are explicitly considered.

The example presented in figure 6.2 describes how a recruiter requested both PRINCE2 and ITIL; however, critically, these standards have i) nothing explicitly to do with each other and ii) are not relevant to a project management job. The stakeholder who appreciates this knowledge can question the advertisement as part of a closed control loop, and the recruiter and managers can clarify the role in the context of this knowledge. If the case is controversial, then additional external expertise can be gained until a resolution is achieved. If no resolution can not be achieved, then clarification of the position will ensure that this decision is justified and not as a result of bias or subjectivity. Remember that this knowledge has a clear score and teachable, authentic sources. Those values will be counted in the point system so the task becomes apparent.

## **Combination approach - Advertising the Job**

This is explicit knowledge to explicit, objective to the environment, which is a straightforward process to adopt in this section, like program certification that fits the task. Also, due to managers' lack of knowledge and in-depth understanding of such work framework, some managers mix more than one framework, which is ironic. However, no one can tell managers this is irony, and on what basis is the manager combining more than one framework? The ironic approach managers use untested, taking one bit from this framework and another bit from another, losing the big image. This kind of approach, when discussed in public, will be criticised and removed.

### **Aim**

Discovering an unknown certification could be essential to the role, so the owner can explain this certification's value to the recruiter and the people around him. Explicitly falsifying destructive behaviours when managers try to complicate the position by telling job seekers or placing a requirement that we are using X framework and Y framework inside X.

This could happen in the ITIL framework because the framework for an organisation, and still inside rehearsing phase or Release and deployment, managers could use project management methodology. But this could not happen in PRINCE2 and PMP, so no one mixes both methods because it is inappropriate and conflicted, untested and using an untested approach means ambiguity.

### **Objective**

The free interaction between stakeholders and encouraging the interaction process with an active response from the recruiter help achieve these goals.

### **Description**

The combination phase relates to converting explicit knowledge to explicit contextual, relevant rules and processes. Suppose a manager lacks an appreciation of standards and frameworks. In that case, it is also possible that the same managers would pick and mix processes from multiple frameworks, such a fact spotted in data collection and job description. Sadly, however, the basis upon which the manager selects and combines framework components may not be clear and tested, thus, losing the big image value of framework adoption.

If highlighted and discussed in public, this approach will support internal improvement and process development, possibly supporting better framework alignment.

Discovering that an unknown certification is essential to the role adds value to the company, as the new applicant will bring this knowledge to the company. Moreover, explicitly identifying false, conflicting, and destructive claims and knowledge is important. Managers might try to claim that 'we are using both frameworks X and Y', yet this may not be advisable for certain standards, for example, PRINCE2 and PMP, because a mix of methods is inappropriate and can cause significant process conflicts. The free interaction between stakeholders and the encouragement to engage with the open and transparent interaction process help achieve these goals.

The interaction allows stakeholders to express the value of X certification and how it could help this role. Accordingly, the owner of this knowledge can explain and educate other key stakeholders in the environment. Iteration of the advertisement allows everyone to clarify what is required and whether specific skills are needed. Hence, this SECI process helps shape the business and job seekers over time, pushing them to get more education and knowledge in this open meritocracy system. The combination supports the circulation of knowledge, encouraging stakeholders to gain awareness and knowledge through job-seeking advertisements. Also, when someone introduces wrong information, another person who owns the same knowledge becomes a whistle-blower to ensure an open seeking of the objective truth.

## Internalisation approach - Advertising the Job

This section reflects the process in the past stage; however, this section concern the education program. This phase expresses the education program knowledge, so it is a straightforward stage comparing the education program demanded in this section. So, this section could support and educate managers if there is a new program that could be beneficial to the role or the company, and if managers ask for conflicting requirements, the job seeker or stakeholders could fix such issues.

### **Aim**

Helps the recruiter to discover an unknown degree program that could be important to the role and eliminate conflicts in the job description.

### **Objective**

The interaction between stakeholders helps this aim.

### **Description**

The internalisation phase expresses the education of concept knowledge (explicit to tacit) that could be of benefit to the role and the company. For example, lessons learned concerning the job role and advertisement creation might change how stakeholders appreciate the role. Moreover, knowledge concepts identified within the combination phase may highlight deficiencies in areas of company knowledge. As such, managers might be more positive about investing time and money in educational programmes to train relevant stakeholders and staff concerning newly identified knowledge. Internal training may also be set up to update staff on aspects of misunderstood frameworks and methods, and critical staff may be challenged to complete relevant academic apprenticeship or accreditation courses.

For the sake of discussion, suppose University develops a new program after an in-depth study by scholars; when first introduced, let's consider the usability engineering program; the recruiter does not know about it. The manager and recruiters rely too much on information fed to them from the superior chains introducing them to this program. This practice or the current approach makes them biased toward superior chains. Let's assume one of the superior's chains is evil, so one piece of information is correct, and another is faulty or wrong. This practice leads to knowledge damage because managers can not verify the correct and wrong information.

Nowadays, University develops new programs and mix different fields of study. Those who graduated are victimised because of recruitment and the manager's ignorance of such fact. At the same time, the closed loop demonstrated by the interaction between stakeholders solves such problems by identifying this program and removing ambiguity.

## 6.5.4 (Stage 3) The Point System and its integration with SECI.

### **The challenges**

The knowledge and requirement are too many and very hard to segregate and assess in discovering the best candidate; the point system aims to quantify and ease this task. The SECI phases aim to reveal bias

in the point system if the manager gives a higher score to someone than what should be. So, each bit of knowledge is subjected to the point system and the applicant's CVs, then summing both CVs and job descriptions and then discovering the best score as the best candidate.

### **Aim**

The point system aims to quantify and categorise job knowledge, making segregation and selection easy. The point system serves three tasks; first, quantify knowledge in the job description by giving value to each phase; second, quantify the CV points accordingly; and third, scrutinise the CV through the SECI and highlight lies. The point system should involve four stages. All these stages should consider different criteria. The author could use 100 points for each section of the SECI or any other number; the bigger the number, the better, and the more detail are highlighted. Also, there is no panacea point system, so each company has to invent a point system accordingly.

### **Objective**

A point system could develop through a detailed investigation of the job requirement and subjecting the study to socialisation inside the corporation and with a stakeholder to achieve the goal. The point system assigned to the job description and CVs is explicit and scrutinised through the SECI phase, so everyone agreed on it after it was placed in the job advertisement stage. It becomes objective because this study is pragmatic. When everyone agrees on this point system, it is working, which means it is clear and has no subjectivity. So, the majority of stakeholders agreed on eliminating the subjectivity of the point system. According to pragmatics, what works fine is correct, according to Hevner (2004).

The process ends by assigning values to each CV, based on the four SECI phrases matching them to the job requirement that is also quantified. The SECI scrutinised and highlighted any bias in the process. for example, high value to one aspect of CV or Job requirements. This process could be implemented through a standard platform; the process only matches and verification that the matches are fit for use and purpose. The interaction and explicit system falsify and highlights any wrong information placed in any CV because CVs are explicit concerning anonymised identity.

### **Description**

If there are multiple applicants, it can be tough to distinguish and assess which candidate is best for the job. The researcher proposes using a point system, as suggested in chapter 4, to quantify and ease this task. The SECI approach can also be used to allocate the points to help the company reveal possible bias in allocating points. Accordingly, each bit of knowledge in each of the SECI phases is subjected to the point system. Finally, all relevant, validated CV contributions, which align with the job description, should be summed to discover the highest score that should be the best candidate based on validated knowledge. Also, CV data is anonymously collected and separated into SECI phases using appropriate mechanisms to store CVs with respect to anonymise identity, which encourages socialisation between relevant stakeholders. Suppose a company is looking for a computer scientist who also knows agriculture. Anyone might claim to know about agriculture; however, when the CV details are listed, a

knowledgeable independent expert can validate relevant knowledge and wrong question information being claimed by a candidate. This knowledgeable individual may not be a recruiting manager or even a selection decision maker, yet the feedback process provides the decision maker with considerable information about what knowledge is relevant (or core) and what information is potentially incorrect or fraudulent. The interaction and learning process greatly benefit long-term company development. For example, if someone claims that they did Pascal programming in Quantum Computing, the recruiter or managers will not know pascal will not work in a quantum computer. However, other individuals in the domain could falsify this because this person is a competitor with the same knowledge domain and beneficiary, and falsification is definitely supported by evidence. So, tacit knowledge is verified indirectly for the recruiter, and they can learn from this interaction and continually improve their knowledge. Also, they can request that X bit of knowledge should be explicit.

### **Requirement for a Points system**

The use of a point system was suggested in chapter 4, data collection methods; however, it is essential to clarify that no generic points solution is possible for the job description and that each company and role will require a considerable investment of time to identify and quantify the most important criteria. To support this process, the researcher suggests integrating the SECI approach to allow open justification of points and reduce the chance of a biased allocation of points. It might be appropriate that each section of SECI is given different or equal importance but explicit, and maybe 100 points are allocated for each section, considering some areas should be a must-have.

The preferred suggestion is to systematically and iteratively consider the job description and requirements list and use socialisation inside the corporation to score parts. Considering each requirement, in turn, allows the independent consideration of its importance. Whatever approach is deemed contextually best, the points system needs to be explicit, and both the system and allocation of points need to be agreed upon before scoring commences, thus, making the process objective and pragmatic. If an agreement is not gained, additional internal discussion and justification are required to identify where disagreement exists. Ideally, however, everyone agrees on allocating the points system in the proposed approach and evaluating the approach or the marks allocated to key component parts. When a general agreement is gained, then subjectivity is removed. Accordingly, and in line with the pragmatic methodology or explicit ideologies, if the solution is agreed upon, then use the solution as appropriate (Hevner, 2004).

The candidate's knowledge should include relevant work-based experience (essential to meet the definition given in the job description); however, it may consist of non-work-based experience (relevant knowledge but not defined in the job description). The point system aims to calculate the candidate's knowledge, asking the candidate to codify and evidence implicit or tacit knowledge. If the evidence does not exist, and the knowledge is core to the role, then an examination (possibly online) could be



arranged to objectively quantify the candidate's knowledge level, thus, supporting objective, unbiased scoring and selection. Nowadays, computerised exams are less costly and affordable, so the system always codifies knowledge and helps people codify it.

It is essential to highlight that experience is not measured by time; for example, some people spend years doing the same thing at the job. Although these people have a considerable repetition of experience, years of experience should not be used in the assessment/scoring system as an equivalence to 'breadth of knowledge'. A lack of experience scope might, for example, highlight metathesis-phobia (The persistent, abnormal, and unwarranted fear of change.), which raises questions concerning the willingness to adapt, change, and evolve.

If a person uses excel equations each day for years, however, the complexity of use is low, this does not mean that the candidate can programme and automate Macro in VBA. Clearly, years of experience do not effectively demonstrate a level of knowledge. Within the scoring system, the key is to divide knowledge according to SECI, ideally with explicit knowledge having a higher value than implicit validated knowledge – however, both are important.

Since explicit knowledge has a higher value than implicit knowledge, the knowledge harvested from combination and internalisation is considered to be of higher value; as such, the researcher suggests a higher symbol is applied to acknowledge and categorise knowledge explicitly. This approach is the segregation of low-value knowledge gained from socialisation and Externalisation compared to high-value knowledge.

For example, working as an operation manager for years, and maintaining the current system, does not mean (as described in the example in chapter 5) that the candidate knows how to optimise the operation process.

The author argued previously that almost anyone could learn to run operations, but questioning faults, understanding root solutions, and optimising the operation process is an entirely different issue. This questioning approach is a Socratic argument, called the method of Elenchus, where questions lead to knowledge.

Although the researcher suggests that implicit/tacit knowledge should focus less on the points system, a candidate might have implicit/tacit knowledge that is considered crucial to the role. In situations where tacit knowledge is critical to the role, the researcher suggests that a codification process should be in place to verify this knowledge and convert it, ideally in an assessable form on a continuous scale, to explicit knowledge.

Explicit detail of the point-scoring process, with links to the forum discussions and mapping for their application, should be available to the candidate. Moreover, the decision mapping for the final candidate should also be open and publicly visible to all competitors – obviously removing key private and

personal parameters. Allowing the candidate to view their mapping lets them see their missing skills and how the evidence was graded. The candidate can oppose the outcome with evidence by contacting the recruiter, making the process a closed loop.

At a predefined time, the final decision has to be made based on the evidence available at the cut-off time. The recruiter is responsible for responding to issues before the cut-off and answering any complaints after the cut-off. The employer should not dismiss feedback and should interact with candidates who feel victimised or undermined based on the point system with evidence to fulfil the SECI interaction methods. Reflecting on issues raised is important, as themes raised at this point help define future process improvement. Ultimately, the recruiter should justify the outcome. As stated, a law firm is encouraged to monitor this process to highlight bias independently. If bias is identified, disciplinary action must be taken, and company processes need to be changed.

To sum up, the implicit or tacit knowledge calculated in the point system has a lower value. However, suppose a candidate has implicit or tacit knowledge, which is crucial to the role. In that case, a codification process should be in place to verify this knowledge and convert it to explicit. Computerised processes will reduce cost and affordability, and as soon as knowledge codify, it becomes explicit.

There are currently lots of government programs that could help at this stage; when job seekers continue applying for a job to help codify tacit knowledge in the CV platform and consider several avenues of knowledge through books, self-learning and much more.

### Socialisation - Employing the point system.

Socialisation includes but is not limited to knowledge from tacit non-verified sources. The knowledge owner has no verification process to measure the amount of understanding of this knowledge. However, codification of knowledge is required if this knowledge is crucial.

Understanding, for example, the candidate's hobbies or breath of reading, might be seen as important, by the community of stakeholders, to the candidate's suitability for the job role. It is easy to state on your CV, irrelevant of the facts, that you speak five languages and do martial arts and computer programming as a hobby. All candidates potentially have the opportunity to expand their tacit skill set on the CV, as it is hard to prove tacit knowledge without additional verification. It is important; however, that tacit knowledge is verified because i) tacit knowledge linked to the job role should be credited to the candidate, and ii) the stating of false, wrong, or untrustworthy information should negatively flag an intention to mislead. If the candidate were invited to a recorded interview, i.e., to clarify facts and details, then it would be easy to verify (using feedback from socialisation) whether CV claims are accurate.

For the sake of discussion, assuming a candidate lied in the profile socialisation phase claiming professionalism in computer programming, assuming this knowledge is irrelevant to the role but still has value. Thus, in the recording interview, the interviewer can select a random, irrelevant entry and verify

the entry if the candidate objectively lies in the CV, meaning clear evidence; the selection process rejects this candidate unless converted this entry to explicit, even if the candidate is most suitable for the role. Then flag that this entry should be verified and converted to explicit. This argument supported Jaime's (2020) punishment base bureaucracy but has less subjectivity and impact if used unlawfully. However, the socialisation loop of stakeholders, including other job seekers, could falsify lies that have unscientific claims, as demonstrated in the above example, where a candidate claims a pascal program in a quantum computer. Although this requires a niche subject specialist, any stakeholder, including other job seekers, might figure out this is unscientific and provide the evidence even though the managers might have zero subject knowledge.

Candidates should be encouraged to verify, via codification, all critical knowledge required for the role. However, the knowledge that is not deemed critical should be left unverified but should be true. As such, the details of all candidate CVs should be available (but anonymous) to all relevant stakeholders. If any stakeholder objects to the validity of a specific claim, then additional clarification and a request for additional evidence may be required. If the objection is valid, and no additional evidence can be provided, then this information will not be considered in the calculation, flagging further steps.

A points system should be approved, fully supported, and endorsed by all stakeholders. Suppose a limited number of stakeholders argue against the defined points system after the socialisation phase has been completed. In that case, it should be legally considered, yet consensus must be accepted if most stakeholders agree. The general agreement does not automatically mean that 100% of biases will have been eliminated; however, open transparency, feedback iteration, and legal checking would support significant bias and subjectivity elimination. Once the stakeholder agrees on the socialisation phase, the selected CV, Job-description, and point system, the mapping and calculation can be openly justified. The key is to make everything explicit, agree, and convert tacit knowledge into explicit knowledge.

Key soft skills, cultural norms and approaches used within the organisation should be documented at this point, and possible candidates should gain agreement. For example, if all business in the company is conducted in English, then proof of a certain level of English ability might be deemed essential for employment. If the candidate does not already have an equivalent qualification, then the company should not offer employment until this tacit ability has been explicitly verified. The company might offer support and access to online English tests, et cetera; however, it has been agreed, via socialisation, that employment is not given until key criteria are met. Alternatively, suppose the candidate is a non-smoker, yet the team consists of smokers (and company policy – assuming no legal conflict – allows smoking). In that case, this information should be declared from the beginning. If this information is transparently declared, and the candidate accepts employment, then the candidate should not feel they have a right to complain later about this situation. Although the researcher is not endorsing smoking, the candidate should not take the Job if they disagree with an openly declared company norm or rule.

Additionally, all candidates should be subjected to the same scrutiny in profile verification, which means, the interviewee should be subjected the candidates to the same questions and verification, recording the interview, anonymously covering all identity then posting it to all stakeholders.

If a personality or physical characteristic, such as verbal tick, strong dialect, and a physical disability, could impact the candidate's ability to verify knowledge critically, then open feedback and interaction are required; to ensure that both the candidate and decision maker are aware of the issues from the other's perspective.

The decision maker might request that the candidate, for example, "please talk slowly so you can be better understood", and the candidate might highlight issues explicitly and request specific adjustments (as required). Thus, increasing mutual awareness and reducing legal and bias ramifications of ignorance. Suppose the candidate does not inform the decision team of issues. In that case, the decision-makers are much more likely to dismiss mistakes and consequently blame the person for issues caused by their personality or physical characteristic, sadly ignoring the knowledge that they possess. Accordingly, dealing with each case in a clear transparent manner is important.

Again, to sum up, the company and the candidate should be transparent on the following.

1. How much tacit knowledge is required in each part of the Job? For example, coding, tools like excel, considering Google bias, and knowledge-based where all the information is there. So the company needs to be clear about what they are looking for in the role.
2. How to measure tacit in each task, consider retrieval theory where information is transferred to extended memory. So, how many roles did the candidate use for the specific Job?
3. Evidence of tacit Knowledge, even by company certification (non-credited certification) (Externalisation) or several roles, has the same function.
4. If no evidence is given but firmly stated in the CV and it is essential for the role, an exam is required; this knowledge becomes explicit and moves from the candidate profile from Socialisation to externalization.

Let us assume someone is gifted and masters X knowledge. So, the knowledge stated in the CV but no evidence, an exam, or tasks in a place where the candidate considers it comfortable with the camera open during the X hours, break X minutes, and second, X hours. (So, knowledge considers if it is evidenced or non-evidenced considering the point system). Further, when the candidate took the exam, the exam company should provide him with certification, so no one objected to this knowledge later. Otherwise, it will become biased as some people have taken exams after others, and others just got hired.

- Evidence could include, as part of Externalisation (tacit to explicit)
- Explicit letter from employment; consider letter verification.
- Employment certification considers verification.

- Phone call verification with a must recording and documentation, then voice-to-text transcript and shared with all parties. In manipulating cases, the law process can take place to prosecute the manipulator and reimburse all costs.

The same point system could employ in all stages; consider each stage

### Externalisation - Employing the point system

The role of the externalisation phase in selecting each candidate according to the modified SECI and point system is a straightforward process because, at this stage, only calculating the scores explicitly, and should be no objection from stakeholders because a direct or indirect approach verifies this kind of knowledge.

Candidate scores should be explicitly determined, and will likely be no objection from stakeholders when there is a direct mapping of explicit knowledge. Externalisation relates to essential tacit knowledge, objective knowledge of the environment, and verification, allowing tacit knowledge to be included in the scoring system. Accordingly, a letter from managers or a reference letter – that provides indirect verification – may be enough evidence to support the inclusion of this knowledge in the scoring process; however, the level of verifying evidence will be impacted by the importance of the criteria. If appropriate verification evidence cannot be provided, then the knowledge is not considered explicit and should not be included in the scoring system for the externalisation phase.

### Combination - Employing the point system.

If a stakeholder has an objection to the scoring or knowledge verification process, then the objection functions as a whistle-blower or alarm step. Checks can be made on the organising knowledge and assumptions. If an issue is identified, then adaptation and integration of the issue in the company's conceptual knowledge can be completed. Only explicit knowledge must be considered, and the scores are calculated explicitly, thus, removing objections. So, only calculate the scores explicitly and should be no objection from the stakeholders. Bear in mind this is clear, verified explicit knowledge like certification from a credited organisation; therefore, only give a score and move forward to the other bit of knowledge.

### Internalisation - Employing the point system.

The internalisation phase in the selection process for each candidate according to the modified SECI and point system is exactly the same only calculation explicitly. Bear in mind that this degree program is already quantified, so allocate a point and move forward.

To sum up this stage, the system can quantify job descriptions and CVs and consider anonymization; therefore, selecting the candidate is possible and employing the same SECI phases when selecting the candidate where meticulously consider the CVs and point system.

## 6.5.5 (Stage 4) Selecting the Candidate

### The Challenges

This is a preliminary selection and declaring who has the highest score in case of biased or conflicts; people can object and declare it, so they check the four sections of the knowledge to spot where the bias happens. The checking uses a dual approach like a point system first, and second any methods like an interview; the key is an explicit system.

Select the candidate according to the point system in the second stage after recruitment; company management is often involved after the recruiter. In other words, the stage represents direct hiring or second-stage hiring.

The company can employ the exact measurement of the four factors Socialisation, Externalisation, Internalisation, and Combination.

The decision-makers evaluate a candidate based on the same above factors. Whatever the final methods are, people suggest different approaches. For example, suppose the company management chooses an interview. In that case, the process recorded anonymising the image and explicitly listed it under the job description and the texting boxes. Again, a closed loop will consider people's feedback and scientific comments regarding performance and answer the question. A controversial argument could be taken as an open loop for lesson learning.

The initial outcome is also listed under the recorded interviews subjected to feedback. The chosen person's scores are also displayed with the other competitors and why the candidate got this score. So, the data is qualitative and quantitative, as both approaches lead to perfection or idealism. This step is based on the evidence that people are stressed and unsure why they have not been chosen, reflecting that life is not fair and biased. Adelina Broadridge consolidated this fact when she validated a job market study and contended that "job-based on whom you know, not what you know."

There is no overqualified consideration because it becomes a source of bias and excuses in taking someone in contrast to another person who clearly has high knowledge. So, the manager starts to push away a higher qualification to keep himself the only knowledgeable person in the bubble around the manager. Furthermore, the manager develops bias from higher qualifications as when they make mistakes, a less knowledgeable person could be oblivious to these mistakes. In contrast, a higher qualification could spot these mistakes. Therefore, the manager rejects overqualified, using this overqualified as an excuse. In fact, according to SECI, this could benefit the socialisation phase inside the company. So, suppose an overqualified candidate accepted the role. In that case, the hiring body should not reject the person claiming overqualification as an excuse. This is because the SECI points out that being overqualified could help codify and improve knowledge. Suppose the recruitment body is concerned that the overqualified could leave the role. In that case, a one or two-year contract should be in place to overcome this concern.

In previous papers and literature reviews, there is a plethora of evidence demonstrating that being over-qualified is a positive, not a negative, sign for the company.

Those steps eliminate outrageous outcomes so that the law can take place with lots of evidence. The study suggested that this process is only for a worldwide company with a public interest, not an SME company. Where SMEs are family businesses, hiring based on biases or not, they are free to do what they like. This step is because the manager should not benefit from his position in a giant corporation by ignoring company guidelines due to public interest through company share value that could be impacted by employee performance, as shown in Chapter (4,5).

### 6.5.6 (Stage 5) Declaring the Choice

#### The Challenges

Declare the final selection candidate according to the point system and any other methods to make sure there is no objection. The candidate who faces objections could get a lower role; in the end, this process will be left the level of people's knowledge and candidates because everyone seeks knowledge to get the job.

#### **Aim**

Eliminate bias through a point system and monitoring process. Furthermore, removing the impact of the unfairness of the job market on society and individuals leads to people losing faith in the system. The decision-makers could have a conscious and unconscious bias that could affect the discussion. Still, when we have an explicit point system and an explicit interview, the room for biases is mitigated because people will object to the outcome. Moreover, a law firm could act as a monitory body because they are beneficiaries and make money from the system. So, the system is open; any beneficiary can assess it; this was one of the issues in the old system (no evidence or hard to get proof).

#### **The objective**

The objective is fulfilled by the explicit system and point system, employing technology like a camera, mirroring recruiter desktop and other technology mentioned in this chapter. Education could eliminate unconscious bias; however, conscious bias is harder to eliminate and requires a robust mechanism.

#### **Description**

Traditional decision-makers have considerable power. History is formed by people with power, particularly if accountability and regulation are limited, consciously or unconsciously manipulating outcomes to support their own outcomes.

The proposed steps provide a systematic process, an explicit points system supported by confirmation activities, which removes the power held by any specific individual, and the room for subjectivity and bias to form, thus, significantly mitigating bias in the employment selection process.

The consistent use of transparency, and the inclusion of an independent moderator (i.e., a law firm that potentially makes money if wrongdoing is identified), helps to ensure regulation and discipline via the application of the Hawthorne effect (that is a type of reactivity in which individuals modify an aspect of their behaviour in response to their awareness of being observed) - as people are always aware that all the justification for actions can be critically questioned. Unlike traditional selection processes, the proposed system is open, and anyone can follow and question the evidence for decisions being made. The explicit points-based solution, focusing on knowledge verification, places the decision maker in a glass box, where every action can be openly followed, and all wrongdoing can be questioned. Because of the iterative control loops used across SECI phases, the company can systematically i) educate itself and ii) eliminate unconscious bias from company practice. Although conscious bias is harder to eliminate and requires a more robust mechanism as below:

1. The use of transparency throughout the proposed solution,
2. The increased willingness for feedback and correction,
3. The reduced power allocated to specific individuals, and
4. The suggestion to use independent legal regulation makes it extremely hard for individuals to manipulate bias for personal gain.

For example, if the recruiter's friend wants to gain employment, then the recruiter would have to manipulate the formation of a job description and the scoping system and manipulate interaction with all stakeholders to give their friend a chance of being selected. The likelihood, in reality, is that either i) a job seeker (as a whistle-blower) would question the value of the job and ii) a conflict of interest would be raised concerning the recruiter/applicant relationship, and the recruiter would be removed from any interaction relating to the selection process.

Because of the openness and transparency in the system, other job seekers and legal moderators act to raise an object to questionable behaviour, highlighting the need for all stakeholders to provide strong evidence for a) job and assessment criteria and b) verification of knowledge – particularly if knowledge is deemed essential. Thus, the role of the decision-maker primarily relates to the following:

1. verification of applicant claims,
2. They supervised and management of the development of the points system.
3. They are questioning stakeholders to ensure the point system is fit for use and purpose.
4. Managing objections raised by stakeholders concerning the job role, job description, advert, allocation of points, feedback, and consistent application of the process.

The focus on evidence means that unlawful acts should be eliminated; since everything is recorded, and multiple mechanisms should highlight issues and problems.

The law firm monetary body suggestion is because the researcher seeks all possibilities and the law's role in protecting candidates; this finding in an ethnographic study after consultations with a law firm



explicitly informed the researchers that evidence is the issue in proven bias. So explicit processes provide evidence. In other words, the author contacted such a law firm and had a long conversation with them for over an hour explaining the study's nature. The case handler did explain that it is hard to gain evidence. They have seen that the company attorney is playing with evidence to win the case for the company; also, information is fabricated.

The author requested permission from the case handler to use her name, which she refused. So, the proposed system allowed the law to prove the bias as an illegal activity through recording and an explicit system. The unlawful act is eliminated with everything recorded and anonymised because two mechanisms could point out the issue.

The use of the traditional employment selection system restricts the chance of anyone practically identifying unlawful activity in the company because i) application information is often complex, and ii) the process is closed and restricted. Although many managers might celebrate this fact, such individuals are likely not to see the value of bias removal and would not openly and transparently welcome the introduction of any external and independent monitoring body.

So, after understanding the bias, where it could happen and why it could happen, and after understanding a different kind of bias, the study concludes that the current system is faulty and CV does not fit for use and purpose. The study also concludes that any monitoring body could have a bias because it is in human nature and a reflection of bias developed through observation, action, and reaction. So, the solution adopts the ITIL approach of process owner and process practitioner as two mechanisms to monitor the case. The monitoring bodies are more than one firm that are beneficiaries of finding fault or bias. Thus, this is the best way to overcome the majority of bias.

The data collected from job seekers in Chapter 4 showed that many people had lost faith in the process. Eliminating subjectivity and bias via the five-stage SECI-focused process offers the potential to remove a considerable proportion of unfairness from the job market. This unfairness impacts society through storytelling to level people accept unfairness as a norm in society; this is against government inclusion policy.

The researcher aims to incorporate these steps as part of a complete DSR artefact design in Chapter 7.

## 6.6 Conclusion

This chapter introduces and justifies the specific use of SECI in the employment domain and considers, within the context of the DSR Rigor cycle, how to incorporate SECI into the employment selection domain. Although this integration could be used as a standalone and independent method, i.e., to support the mitigation of employment selection issues and biases, the outcome of this chapter will be used later in the thesis (in line with the design science methodology) to support the development of a solution artefact.

The researcher introduces a 5-stage method to consider relevant knowledge management adaptation in the new design artefacts. Stages are based on Arthur (2006) and include: i) writing the job description, ii) advertising the job description, iii) considering the point system, iv) selecting the candidate, and v) declaring the chosen candidate. This cycle of steps, and the application of SECI within each step, is the outcome of considering the problem in the context of the fundamental theory/methods from the Kernel theory (Hevner 2017) and therefore represents the skeleton of the DSR artefact design.

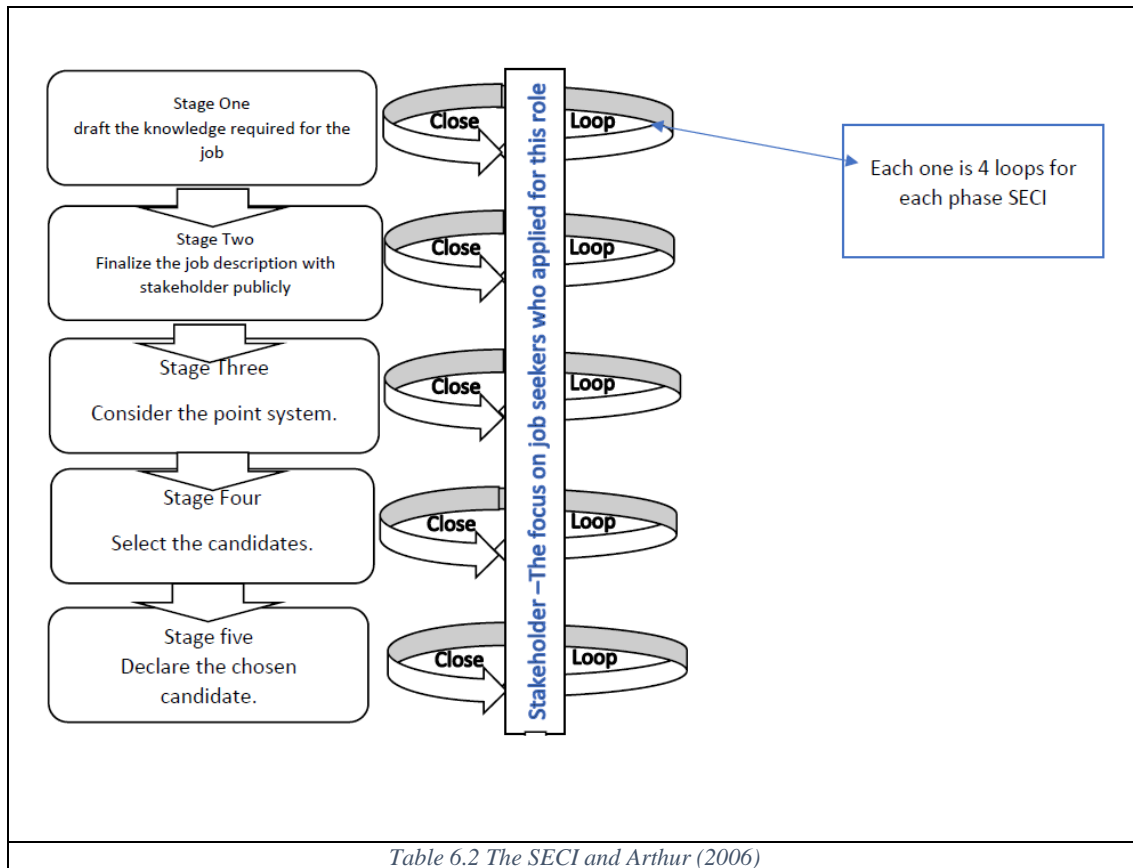
However, it is essential to clarify that such a process has been designed primarily for use in larger companies with a public interest and is harder to implement within an SME (Small to Medium-sized Enterprises). Although smaller companies could implement the 5-stage process, i.e., SMEs and family businesses, the size of teams is much smaller, and key community of practice stakeholders are likely to be included as part of the short-listing and selection process. The smaller company is not the study concern unless it has public shareholders and impacts the public domain.

Irrespective of the business size, the proposed five stages and a focus on the assessment of the knowledge help to make the process repeatable, with a reduced chance of biased compared to the traditional selection approach. As such, the researcher will move to the DSR design stage, bringing together the ideas presented in chapters 4 to 6 to develop an overall system that removes subjectivity and mitigates biases in the employment selection process.

To sum up, this research successfully adopts the theory of Nonaka and Takeuchi (1995) in the employment selection process by codifying knowledge in CV. The contribution is merging Arthur's (2006) employment steps with Nonaka and Takeuchi's knowledge-creating company to remove subjectivity in interpreting CV knowledge and also codify knowledge in CV and the employment selection process. The outcome becomes the kernel theory of the design that adds rigour to the overall system that aims to remove subjectivity from the employment selection process. Hevner and Chatterjee (2010) evident that knowledge management theories like Nonaka and Takeuchi (1995) can be kernel theory.

This approach makes the process repeatable, meaning scientific, with less bias than the past approach, where the employment selection process was not repeatable.

The process will be repeated if the same people or the same knowledge exists in the process, which is an approach used in cyber security where repeatability is the key to evidence; therefore, the first process in cyber security is preserving the image and then employing the same methods. See the diagram below.



The Design Stage  
Second Iteration  
Chapter Seven  
Developing an Artefact to Mitigate  
Employment Selection Bias

## 7.1 Introduction

The current employment selection system impacts almost every citizen; however, it fails to consider the views of different stakeholders equally. The hiring manager aims to select the best candidate that fits the role; however, decision-maker subjectivity and bias often impact decisions consciously or unconsciously. Due to limited access to evidence, the law cannot manage subjectivity in the domain, which gives job seekers the impression that the law is not protecting them. This point could develop several consequences outside of the study scope.

In chapters four and five, the researcher identified several components in the current traditional system that cause high subjectivity, whereas in chapter six solution proposed to overcome subjectivity; therefore, within this study, the researcher aims to apply Hevner et al.'s design science research framework to develop a DSR artefact that can mitigate subjectivity and bias in the employment domain.

In Chapter Seven, the researcher presents a complete system developed (from components parts discussed and justified in detail in Chapters four-six) to mitigate bias in the employment selection system.

This Chapter contains the 'building and justifying' step of the design science research framework; however, the researcher recommends considering content as part of the whole, i.e., to understand the design science philosophy more appropriately. The first contribution of this chapter is the artefact, which stands as a prescriptive contribution to world knowledge.

The second contribution is an adaptation of the design science methodology to remove the perishable nature of design science.

This chapter represents the final stage in design science, i.e., the building and justifying of the system, employing the outcome of the past study as methods to finalise the project. The system incorporates consideration of a complex loop, computational thinking methods, ethnographic study methods, the wisdom of the crowd, and Nonaka and Takeuchi (as the kernel theory) to finalise an explicit meritocracy system, which satisfies bias mitigation.

## 7.2 Background for the DSR Artefact approach.

This section builds the new system according to the knowledge obtained from Relevant and Rigger in the two design sciences cycles, phases one and two, where the previous chapters conclude that the current system required modification due to the high subjectivity.

This chapter employs the open and closed loop to achieve maximum benefit; past studies found a way to remove subjectivity and implement the complex loop to maximise utility (usefulness).

The finding of past research become input to this chapter, where the proposed system's findings and the principle of employing complex loops supported by knowledge codification to standardise CV and remove subjectivity from the domain. Those are the leading theory used in the build and justify sections.

The past cycle demonstrates that an open or closed loop will not fetch a perfect outcome when controlling human subjective behaviour. This fact is shown when repetitive testing to bias when it happens, where it happens and how it happens. This theory (loop theory) is embedded in the design, called the **second Kernel theory**; several scholars employ more than one kernel theory in the design (Walls et al., 1992, Merton's; 1949; Livari, Juhani 2020).

According to Koppenhagen et al. (2012), design science considers several patterns: "from requirements to key requirements, from key requirements to design principles, from design principles to design decisions to the artefact and from the evaluation results to potential design theory hypothesise. Koppenhagen's consideration reflects the current artefact that produces the vanilla solution. Furthermore, Hevner (2004) suggested that the artefacts should not be an algorithm or prototypes; instead, they should be innovations, practices, and products that reflect the implementation and use of Information systems also reflect effectively and efficiently. Vaishnavi and Kuechler (2007) describe a way that can be applied to support the construction of the artefact that seems to be general logical steps to develop an artefact. Alternatively, Sonnenberg and Brocke (2012) suggest an approach that can be used to evaluate the outcome of the steps used during the build and evaluation phase. Those suggestions become lessons learned in this project; however, the evaluation of this artefact will be out of the design science framework because the study has chosen the build and justify, so each theory employed in the design has been justified previously.

There are few articles in IS design science, according to Tovey (1984), that describes the design step in detail or provide detailed guidance on design. This fact, consolidated by Offermann et al. (2009), clearly stated that "artefact design is a creative engineering process that has not much guidance provided in IS literature". Thus, several scholars have developed different ways and approaches to building an artefact, like Hevner et al. (2004), Offermann et al. (2009), and Fischer, Gregor (2011); thus, researchers should improvise the best scientific approach to evaluate the artefact according to its functionality and nature. According to natural science, the five central cores that drive the current design reflect the information system science and concern built and justified. That is because such an approach involves explaining how and why things

are. Worth quoting Simon, 2nd edition,( p. 133-P253) "devising artefacts to attain goals", in the current case, solving the bias by devising a system to mitigate bias in employment selection; therefore, the step of the development is as follows.

First is an illustration of the epistemology of the open/close loop to enable both the developer and reader to share the same principle grounded in the new system because those are the main principle that guides the system.

Second is the contextualisation of the closed-loop in design science and the Nonaka and Takeuchi approach. This case demonstrated that the open/closed loop had been tested naturally during the design. The same as the coupling method employed in UML component testing (Vanderfeesten et al. 2007). coupling Metrics used to support business process modelling by evaluating and managing the quality of process models also focuses on interdependencies between models. Thus, this is the case in this study, as each theory introduced to the design has been justified and evaluated previously in several studies.

Third, integrating an open loop to eliminate the remaining biases is also considered an indication of the second kernel theory.

The process of incorporating the open loop in the system because the closed loop alone would not fetch a good outcome in human behaviour. So complex loop with more than one monitoring body is the best outcome.

Fourth, illustrating the perishable nature of design science, this is a weakness in design science that creates a gap in the developed artefact that could be used as a gap to discriminate against people. Therefore, an open loop is needed to trigger modification when required. This open loop could be adapted to the methodology and remove this weakness in design science; the open loop is the method of continuous service improvement adopted from the ITIL framework.

Fifth, the integration of open-loop in design science research makes the research framework non-perishable, i.e. able to evolve over time and deal with requirement change. This approach is because the open-loop mechanism triggers the research owners that a modification is required. This approach keeps the research owner actively involved in past research; this approach reduces the quantity of research and increases quality because of modifications to their research according to the need.

## 7.3 Methods

The study employs several techniques and methods to develop an artefact as a solution; therefore, the outcome artefact is extracted from numerous findings of previous chapters:

- **Chapter 4** This study managed to identify employment stages and understand when, where, and how the bias could happen in a repetitive loop process to facilitate the control component (managers) and the location of the loop. So, it considered the scope of employment selection biases and their impact to help shape the lifecycle stages used in the artefact solution. The five stages (lifecycle) defined and expanded in detail in chapter six benefit from ethnographic stories and adaption of Arthur's (2006) work. The chapter highlights the existence of subjectivity and bias from managers and job seekers, causing unrepeatable processes (see Appendix D).
- **Chapter 5** The outcome of the chapter discusses the need for the open loop and kernel theory to mitigate the weak points in the employment selection process.  
For example, several philosophical approaches and methods are used in the system; the study also enlightens the researcher about the necessity for ways to remove subjectivity, i.e., due to managers' inability to evaluate knowledge systematically.
- **Chapter 6** relates to the knowledge codification of SECI phases (including subjective knowledge) in the employment selection domain, which stands as the kernel theory of the system.

The designed stage assembles all components and solutions discovered and highlighted in previous chapters to create the final artefact.

The final artefact is the outcome of relevance and rigour in both Design Science research framework cycles. The aim is to achieve "satisfaction", i.e., the confident acceptance of something being satisfactory, with the design being tested in a process outside of the design cycle, even though each theory is tested and evaluated.

The next stage first explains the main methods employed in the final artefact and second the main principles and philosophy of the final artefact.

### 7.3.1 The open and closed-loop epistemology

The open-loop system is a defined activity responding to a fixed input or parameter without directly feeding from the environmental conditions. For example, a heating system might be set to turn on between 8 am and 5 pm (irrespective of the room temperature or season).

A closed-loop system monitors the environment and executes a procedure or action to change the environment. For example, a room can observe (via a thermostat) to keep the room at a specific temperature. The open and closed loops are used together, e.g., keeping the room at a particular temperature between 8 am and 5 pm. Also, in a dual-band router in an IT system, a router network detects a failure by pinging the primary IP and routing the traffic to different IP

due to this failure. Similarly, the selection artefact employs several open and closed loops to achieve a specific outcome; this is called a complex loop system if the output is controlled by both open and closed loops or several open and closed loops.

The ITIL publication of a continuous system improvement framework that becomes the de-facto standard in organisation practices utilizes the open and closed loop. This practice uses several forms like double-loop feedback, complex loops, and feedback loop system based on the Plan–Do–Check–Act (PDCA) model specified in ISO/IEC 20000, et cetera.

The Plan–Do–Check–Act (PDCA) model, defined in ISO/IEC 20000, is used as a loop in continuous service improvement to i) ‘plan’ - establish objectives and processes required to deliver the desired results; ii) ‘do’ – to carry out the objectives from the previous step, iii) ‘check’ – which compares data to the expected outcomes to see if there are similarities and differences, and iv) act - where a process is improved. Furthermore, Argyris (1976) describe a complex loop as one of the best organisation practices for Increasing Leadership Effectiveness.

Open and closed-loop epistemology is fulfilled in countless applications and fields of study, including management, computer science, electronics, informatics, et cetera, controlled by the control component. The control component is a five-component system comprising the input, the controlled process, the output, the sensing norm and the control of the norm. Endless applications employ those two methods controlled by the control component.

To sum up, A feedback mechanism could be considered an open loop in the management field. However, Suppose the feedback mechanism interferes with the client, asks specific questions when specific input appears, and controls the feedback. In that case, It will be considered a closed loop. So the process could have both open and closed-loop working together to achieve an outcome. Suppose other loops could control those outcomes, which is called a double-loop system. Suppose the outcome control by both open and closed loops or several open and closed loops; this is called a complex loop system. So, those two functions could have an endless applications; the critical aspect of those functions is to employ them in a way that maximises the benefit of those functions, which is otherwise considered a bottleneck. Hence, considering the control component is essential because it is critical in those functions. Therefore, the study focused on decision-makers as they could be the control component for open/closed loops. This focus is demonstrated in the Relevance Cycle and Rigor cycle.



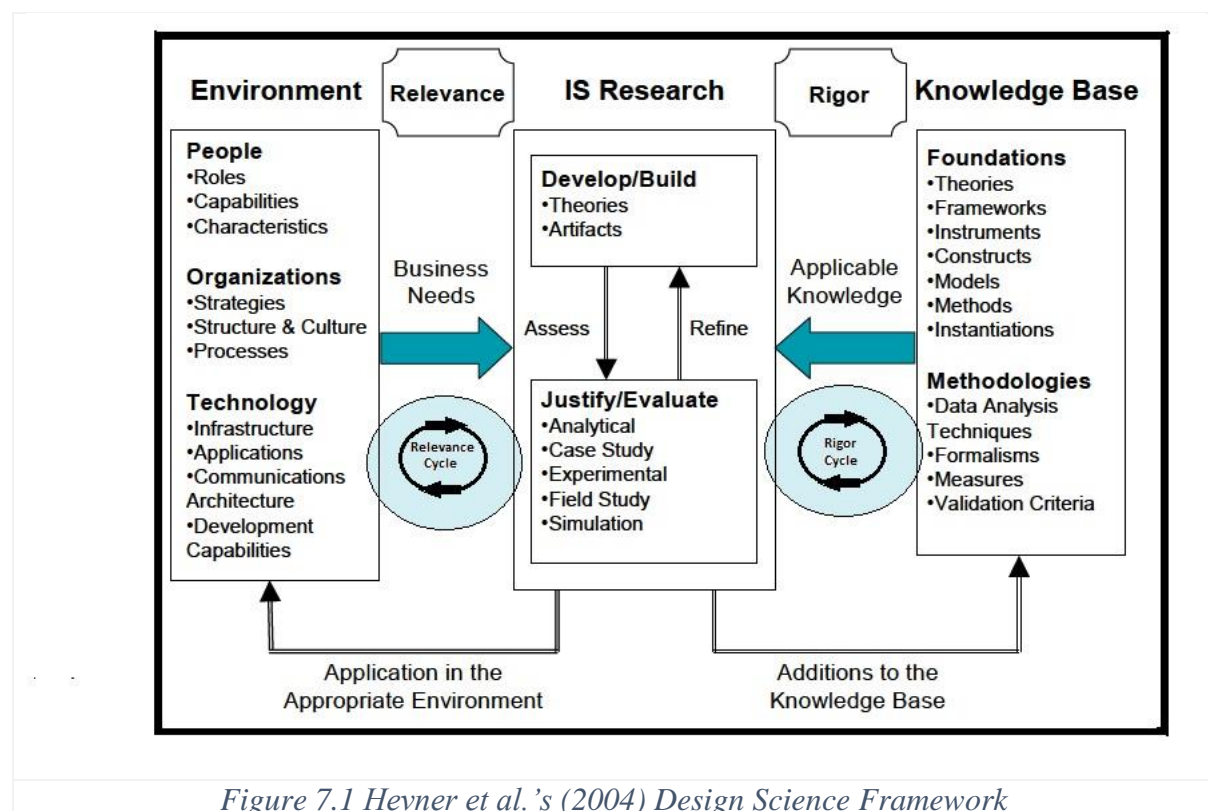
### 7.3.2 The loops coexist in the Design Science and Nonaka approach.

Hevner et al.'s Design science framework consists of three loops represented by the Relevance Cycle, Rigor cycle and developed and justified cycles. The three-loop contains a double loop between developed, justified, and the environment- or knowledge-based (see Figure 7.1).

The contextualisation and existence of loops in the design science and the Nonaka and Takeuchi approach are essential in appreciating the final proposed design. This section considers the loops in Hevner et al.'s design science approach because the study employs the loop approach to solve the thesis problem, i.e., **first**, biases that existed in the work domain; **second**, how to employ the open and close loop in maximum capability and performance. Thereafter, examining the loops in the SECI interaction approach developed by Nonaka and Takeuchi, both employed even double closed-loop or complex loops in some cases (Hevner et al. 2004; Pascal and Renaud 2020).

The study utilises dual action in each process because of this redundancy; it hunts two birds with one stone while employing the methodology, which is **first** understanding biases and their impact on employment selection. **Second**, the best way to utilise the open/close loop.

The last (best way) is fulfilled by focusing on first how bias happens. Second, when it happens and the impact. Third, who could be the decision-makers because the control component depends on decision-makers? Fourth, why does it happen so the loop control this action? Finally, the Fifth repetitively examines the action in a close loop, so the study assesses the best place to involve the control component.



As shown in figure (7.1), three loops with double loops and continuous loops are the fundamental principle in design science. For example, the Relevance Cycle is a continuous interaction between people, organisation structure, process or strategy and business needs. However, there could also be a closed loop between relevance and rigour, as Koppenhagen et al. (2012) stated. The impact of this could be seen as being directly dependent on the nature of the study. The main point is examining those parameters and understanding them through continuous interaction. This interaction could be action research, feedback to assess the domain problem, or any interaction to understand the problem.

Studying the environment through the literature review could also be considered an open loop with filtration because the study outcome reflected the Relevance Cycle. Alternatively, it could be viewed as a closed-loop because the impacts could be direct depending on the study's nature. So, the closed-loop principle is a broad terminology that can be used anywhere. So there is a paradox in considering the design science cycles; Koppenhagen et al. (2012) consider the relevance and rigour as a close loop. However, they can be open-loop because the epistemology of the closed-loop mainly lies with automation. So this paradox depends on how the researcher employed the cycle.

As stated in the literature review chapter of this thesis, the problem lies in employing those loops for maximum performance and capability; this is why the study avoids including the environment and knowledge base, as both are controversially considered closed-loop or complex loops that impact the cycle after them. It is almost impossible to assess the environment's understanding through a literature review due to the literature's vast existence, so it is impossible to determine maximum performance. However, in the Relevance Cycle, the researcher collected people's suggestions, fully benefited from them, and employed them to gain maximum performance by quantifying the process.

Nonaka and Takeuchi's SECI approach to codifying knowledge in the CV is a continuous interaction between stakeholders to justify and understand information. After removing ambiguity and clarifying this information, using the closed loop of socialisation, the outcome knowledge can be defined as 'tacit'. The outcome of the socialisation loop will directly impact externalisation, e.g., the documentation of this knowledge, which triggers the second closed loop, which checks that the documents evidencing knowledge are appropriate.

The spiral of knowledge conversion is also arguably part of a double-closed loop. However, this study did not employ the spiral proposed by Nonaka and Takeuchi but a modified SECI spiral. The study did not benefit from the continuous double-closed-loop as proposed in this case, but two close-loop impacted each other. Still, when tacit knowledge is subjected to verification and codification, this could be considered a double close-loop, as demonstrated in the previous chapter. The combination and internalisation were considered explicit knowledge in this study, so the study did not employ a loop because the study's nature considered this as explicit knowledge. Nevertheless, the SECI used a closed loop to justify this knowledge.

The overall approach of interaction between each employment hiring stage or process with the SECI in the way proposed in this study is a continuous close loop to verify the best candidate adopted from the ITIL framework.

In conclusion, open and closed loops can be employed in different formats; however, the employment of both loops (open /closed), called complex loops, is the study approach. Unfortunately, the researcher spotted several processes employing loops instinctively without quantifying them and understanding the profound meaning, leading to trivialising the benefit gained by employing the complex loop; however, in this study, a scientific rigour approach is followed.

### 7.3.3 Introduction to Artefact Principal according to DSR.

This section is the outcome of five years of study finding after scientifically understanding, evaluating, and justifying each step in the employment selection system. Those steps aim to build an artefact to mitigate bias in the employment selection system that impacts society differently. The outcome only fits intensive knowledge companies but not SMEs; those companies have public shareholders with a huge impact on the country's GDP and society.

The study up to this point explains the new system structure, which is the steps of knowledge codification and adapted processes after modification from Arthur (2006). Hence, it fits the environment intending to remove subjectivity and gaps that could cause biases. The explanation and employment of the open loop in the proposed artefact facilitate the elimination of the remaining biases to achieve government societal inclusion policy, contributing to the world by improving the employment hiring market and removing subjective arguments between jobseeker and managers.

The study aims to employ the open and closed loop for maximum capability and benefit; therefore, the previous chapters examine where and when is the best place to employ the closed and open loop. The examination is first fulfilled in the Relevance Cycle when the study collects people's opinions on several stages related to the loop and the control of the decision-maker component. Then, the study examined the bias when it happens, how it happens, and why it happens in the Rigor cycle. Those are loops checking people's stories regarding bias existence according to bias definition to discover the best place to employ the close loop. Discovering the stage where most bias happens helps decide the best place for the loop as the control stage. Understanding those factors supports the loop's location or where the loop should interact and reflect the environment. In other words, the repetitive loops examinations are the mechanisms to inform the study on where those loops should be placed and interfere to help the researcher understand bias to avoid them.

The final checking is in the design cycle; when developing and justifying approaches, testing 64 options with 77 biases, which are multiple loops, has two aims.

**First**, examine the proposed solution and discover the best location for the loops and the control component that triggers the open loops.

Focusing on decision-maker biases and avoiding decision-maker biases was crucial for the open loop as a control component when the close loop is impossible. This step means that when a direct response according to the environment is unavailable, the open loop will substitute the closed loop concerning the control component. The control component is the decision-maker, rigorously tested and concluded that two open-loop monitors each other. Both have different trigger directions to control conscious human bias; unconscious bias is the best solution. As the process owner and process manager, this solution was adopted first from the ITIL framework. Both entities' primary function is to ensure the process fits for use and purpose.

**Second**, from the massive data collection to understand the problem and biases developed by decision-makers. So there is two knowledge development in this process; the first call knowledge by intention and knowledge obtained by extension, according to Kaplan (1964); the two developed pieces of knowledge are essential to produce the new artefact.

The first knowledge is developed by exploring ITIL and applying previous ITIL knowledge to the artefact; this knowledge links to inductive reasoning.

The second kind of knowledge developed by intention is deductive reasoning by seeking new knowledge through crowdsourcing. (Kaplan, 1964).

The design of the loop is based on logic or sense-making after observation of the data and extracted inference, which is the best solution; this is abductive reasoning, according to Martin (2002). Thus, the design theory aims to achieve the satisficing stage, which is one of the principles in design science, which is fulfilled by the abductive reasoning approach, compared to deductive reasoning, which is insufficient to tackle the design problem, according to Gregor (2009).

The solution demonstrated by the diagram below Figure 7.2 employs a "goal-seeking system." As a solution search process that connected the two worlds as described by Simon (1996 ), which are the "afferent" and the "efferent." those channels function on an abstract level which is the problem environment and the motor environment. So the proposed artefact component responds to a change in the afferent through the efferent environment; in engineering terminology, the input affects the output.

This kind of interaction is highly iterative and needs exploring for the right solution in the efferent. For example, developing components for the artefact will positively affect the afferent, solving the problem requirements "output".

The proposed solution represented by the diagram below is the artefact's outcome. The outcome demonstrates that when the open loop and closed loop work together, they produce a better result that fits for purpose.

This outcome leads us to conclude that DS should have an open loop that triggers a modification if required and not only depends on the loops to produce the artefact. The open loop is a continuous examination of the outcome to ensure the outcome fits for use and purpose. Therefore, adapting the outcome of design science "as a vanilla solution" for an intensive knowledge company has public stakeholders; this outcome is called "nascent artefacts".

The vanilla solution is a terminology that describes computer hardware or software that can be used without configuration. Therefore, adding this outcome "nascent artefact" to the DS framework mitigates the perishable nature of design science. The detail will be in the next section.

The conclusion is a nascent artefact that could be used as a vanilla solution in an intensive knowledge company that has public shareholders. The IT artefacts demonstrate the relevance to a real-world problem, which is considered the tentative design for theory-generating (Walls et al., 1992; Hevner et al., 2004; Gregor and Jones, 2007; Pries-Heje and Baskerville, 2008;).

## 7.4 Design Science Research Solution Design

### 7.4.1 Solution Development

Simon (1996) stated that DSR is about “devising artefacts to attain goals”. According to natural science, six core steps drive information system science to build and justify the artefact. In the context of the current case, i.e., devising a system to mitigate bias in employment selection, the steps of the development are:

1. Illustration of the epistemology in the open/closed loop enables both the developer and the reader to share the same principles grounded in the new system; because communication guides the system design, development, and use (Hevner 2004).
2. Contextualisation of the closed loop in design science and the Nonaka and Takeuchi approach demonstrates that the open/close loop had been tested naturally during the design. In this study, each theory incorporated in the design has already been explained and evaluated in each component part in previous chapters. The loop location and approach have also been studied naturally through the existence of the loop in the process and through testing biases because each bias is tested in a closed loop circle.
3. Integrating an open loop to eliminate the remaining biases is also considered an adaptation of the second kernel theory. The open loop location was tested by understanding the weak point that required monitoring and mitigation. An open loop was required in the system because the closed loop by itself would not fetch a good outcome in human behaviour. So a complex loop, including more than one monitoring body, is the best outcome.
4. The structure of the lifecycle stages, adapted from Arthur’s lifecycle stage (2016), is used (in chapter four) to map the impact of specific biases (see Appendix D); this is presented in column one (see Figure 7.1). The second column, which depends on the SECI approach, is taken from

chapter six and is the kernel theory, supported by the open loop (taken from chapter 5) to mitigate weak points discovered in the environment and gaps found in knowledge understanding. The knowledge codification and the point system were detailed in chapters five and six. So, each bit of the proposed selection artefact is taken from the knowledge gained from previous chapters. Moreover, the methods employed (such as loops, computational thinking, and abductive reasoning) have been critically considered in light of the chapter 4-6 discussion and literature review.

5. Illustrating the perishable nature of design science, which is a weakness in design science that creates a gap in the developed artefact, an open loop is needed to trigger modification when current processes are deemed inappropriate, for example, when feedback objection highlights required changes to the selection process and norms. **The continuous modification methods** should be employed through the open loop and ideally be contextually adapted to fit the methodology and remove this weakness from Hevner et al.'s design science framework. This is one of the main contributions besides the artefact)
6. Integrating an open loop in design science research transfers the research framework to non-perishable. This is because the open-loop mechanism triggers the research owners that a modification is required. This approach keeps the research owner actively involved in past research; this approach reduces the quantity of research and increases quality because of modifications to their research according to the need.

In section 7.5. the researcher will present the outcome of steps 1 to 4. In section 7.6, the researcher focuses on the elaboration of steps 5 and 6, which are concerned with the integration of the selection artefact within the design science methodology to facilitate both:

- i) Consideration and removal of the perishable nature of design science and
- ii) Contextual adaptation and customisation of the selected artefact.

## 7.5 Employment Selection Artefact

This chapter builds the new system in line with knowledge obtained from the Relevance and Rigger design sciences cycles, phases one and two, in chapters 4 - 6. This chapter employs open and closed loops and relevant knowledge collection, formation, and verification processes, identified in past sections and chapters, to remove subjectivity and implement the complex loop to maximise benefit.

### 7.5.1 Design Approach

In our design, the findings from past chapters become input building blocks in the final artefact. The proposed system depends on the outcomes of past chapters and the principle of employing the methods used in the past study; accordingly, the researcher uses the build and justify sections. Also, the author concludes that an open or closed loop alone will not guarantee a perfect outcome when controlling

human subjective behaviour; however, considerable bias removal can be achieved when a **complex loop is involved**.

Chapter Four identified when bias happens, where bias happens, and who is involved (job seeker or manager). Meticulously understanding the data, problem, and past literature are important when employing abductive reasoning, supported by deductive and inductive reasoning, needed to mitigate each problem and why the design needs to be designed in a specific way.

According to Koppenhagen et al. (2012), the design principle and design decision reflect the current artefact that helps produce an employment selection solution template, which businesses can then choose to either apply as-is (i.e. vanilla) or customised as deemed contextually relevant by wrapping the template with Hevner et al.'s DSR methodology.

The proposed artefact is the outcome of the 'build and justify' approach instead of 'build and evaluate'; thus, the justification of component parts has already been completed in chapters 4 to 6. This approach means that each theory used has already been evaluated with positive outcomes, so it is taken in the design as knowledge.

For example, Offermann et al. (2009) stated, "artefact design is a creative engineering process that has not much guidance provided in IS literature". Thus, several scholars have developed different ways and approaches to building an artefact (for example, Hevner et al., 2004; Offermann et al., 2009; and Fischer and Gregor, 2011). Accordingly, the outcome reflects the designer's tacit and explicit knowledge gained from past research, making it complex to document each bit in detail. So, currently, there is no intention to describe every previous scholar's development approach because each approach depends on the nature of the artefact and outcome; however, an example has been given in the case of subjectivity involved in the current artefact development.

The final selection method expounded and justified in Chapter 6 involves developing four columns triggered by the third columns of process steps and three loops (two open and one closed) supporting selection control.

To sum up, a closed loop monitors each stage, and two open loops are controlled and triggered by the public first. This loop triggers a series of open loops controlled by the decision-maker.

In total, there are five closed loops in the second column and twelve open loops controlled by stakeholders who are decision-makers and stakeholders as the beneficiary of the system; the closed loop also could be automated depending on the parameter or interaction.

Suppose in stage one, for example, writing the job requirement and placing it in an interaction form, like any Microsoft interaction form. When several people agree that particular knowledge is needed in this role, this will automatically change the requirement observed by the decision-maker through the open loop.

Likewise, each stage has a close loop that can be automated or controlled manually. In addition to two open-loop, one monitored the other and could trigger a different process.

There are three vertical stages; the first vertical demonstrates the employment selection stages, whereas the second vertical shows the job seeker or stakeholder who would like to be involved in this process. The third vertical stages demonstrate legal monitoring or HR or any legal representation interested in monitoring the stages to trigger the fourth column. So the outcome is an explicit system controlled by the public that allows lawmakers to spot legal issues. The company philosophy in this system should agree that they have nothing to hide, aiming to hire the best candidate according to the knowledge, not hidden conscientious or unconscientious factors, avoiding management biases.

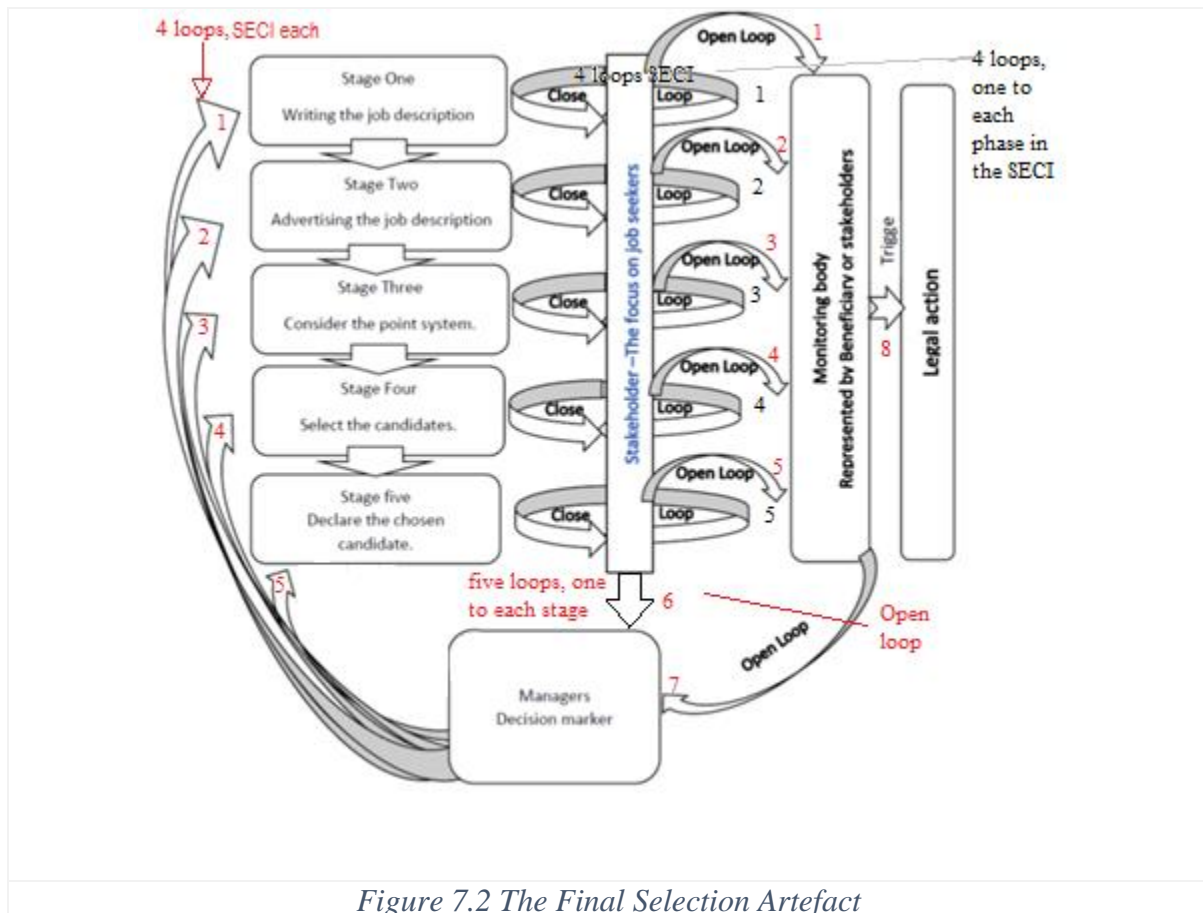
Thus, according to managers, controlling staff by power using biases, punishment and indirectly rewarding staff in annual evaluations is not a way to manage a team and leverage the company in this system. The managers got paid based on their role in leveraging the company; unfortunately, on some occasions, companies sometimes promoted technical staff to managerial roles, which is an unscientific practice. The reason is that the technical manager has zero knowledge of organisational and managerial theory, which leads to undermining and discomforting other staff. This kind of promotion existed in several organisations and justified the technical person placed as a manager as such managers have more understanding and ability to communicate with the team. Thus, if this is the company's approach, the proposed system is not for them because the system employs technocracy and a meritocracy system; this candidate will fail due to the point system employed in the artefact.

The current system depends on knowledge as the only key factor because intelligence is linked to knowledge; according to Flynn 2007, P553-54), knowledge is less biased than experience. So, the system uses Nonaka and Takeuchi's approach to codifying and standardising knowledge in CV.

The horizontal stages adopted by Arthur 2006, in addition to decomposition and abstraction to the employment stages, are supported by the loops to archive the best outcome.

When bias happens, those steps employ stakeholders or beneficiaries as whistleblowers, so they never depend on one human but collectively involve all humans in solving the issue.





### 7.5.2 Final Selection Method: Third columns and Three loops

In this section, the researcher summarises the four columns, which have been described separately in more detail in Chapter 6. In the first column (see figure 7.2), the researcher includes a 5-stage method (described and justified in chapter 6) to consider appropriate knowledge management adaptation in the new design artefacts. Lifecycle stages (see figure 7.1) are based on Arthur (2006) and include:

- i) Writing the job description,
- ii) Advertising the job description,
- iii) Considering the point system,
- iv) Selection of the candidate and
- v) Declaring the chosen candidate.

Each stage has (four \* one) closed loop and one open loop that triggers decision-maker or legal action. Also, (five \* four) other open loops controlled by decision-makers have two purposes.

**First**, monitoring the (five \* four) close loop. **Second**, ensure the process is fit for use and purpose and has no noticeable bias.

There are also three open loops controlled by stakeholders who benefit from spotting system bias: numbers (1,2,3,4,5,6). The closed loops monitor each stage, and the public controls and triggers two sets of

open loops (numbers 7 and 8); those loops trigger a series of open loops controlled by the decision-maker. Furthermore, the jobseekers can trigger a set of open loops (number 6) to the decision maker that can trigger the list of loops after.

This cycle of steps, and the application of SECI within each step, is the outcome of considering fundamental theory and methods within the Kernel theory (Hevner, 2017) and therefore represents the skeleton of the DSR artefact design. At each of these steps, stakeholders are encouraged to highlight any issues or problems, i.e., issues within the job description, advert, points system, points mapping, and verification process. This transparent objection and correct process are represented by the second column in the final selection artefact (see Figure 7.2).

If issues are identified, then interaction with the job seeker allows such issues to be critically corrected. If subjectivity and bias identify a conflict, then changes should be made where appropriate. If issues are considered as possibly illegal, then appropriate action, within the third column, is taken by an independent monitoring body. If no resolution is achieved and the activity is identified as inappropriate, legal action is taken in the fourth column of the solution artefact. Identified inappropriate action also results in changes being passed to decision-makers who can adapt each of the five stages, as required, to ensure that future action is not in conflict.

**In the final selection methods, two sets of open loops are proposed:**

1. The first set of open-loop is triggered if a stakeholder identifies some bias issue or problem and results in the involvement of an independent monitoring body of representatives, who act to moderate company practice concerning job seekers,
2. The second set of open loops - **8** sets of loops in total - occurs when monitoring bodies pass back information concerning conflicts to managers and decision-makers, and changes to selection stages are implemented to prevent such conflicts from occurring in the future.

The closed loops are used in the second column to consider stakeholders' feedback critically. If changes are required to the process within the life cycle stage, then this is fed back to the first column, where changes are made. In addition, feedback is provided to the objecting stakeholder to transparently present what action has occurred. This interaction, as part of stakeholder interaction, allows (via socialisation) the company to learn from stakeholders in order to improve the job description, the advert, the points system, or the verification and mapping of the candidate's tacit knowledge to:

1. Ensure that the job description maps to the business needs and
2. That the company offers employment to the most capable applicant.

In conclusion, a nascent artefact could be used as a vanilla solution in an intensive knowledge company with public shareholders. The employment selection demonstrates relevance to a real-world problem, which is considered the tentative design (Hevner et al., 2004; Pries-Heje and Baskerville, 2008; Walls

et al., 1992). The solution relies on applying complex loops, managing the mitigation of bias, and maximising benefits. In the next section, the research considers how integration with the DSR methodology can help to remove the problem caused by the perishable nature of design science.

## 7.6 Evolve or Perish

After conducting several pieces of research, the system developed in section 7.4 works as a standalone ‘vanilla’ to mitigation of bias in the employment domain. The intended outcome of the system is a ‘satisfying’ outcome; however, the researcher is aware that companies and society are constantly fluctuating. Thus, serendipity becomes a factor in discovering a second contribution to this study that solves the perishable nature of design science, Easterby-Smith et al. (1990, p. 21).

This happens when applying the nature of the design to the methodology and considering Kaplan (1964), which is copying knowledge from one domain to another, the design science framework. Since the system depends on a continuous checking mechanism to overcome a requirement change, design science could adopt this approach to overcome the perishable nature of design science. As such, the following section describes the perishable nature of design science, and the researcher proposes a continuous checking mechanism to prevent the perishing of solution relevance to the outcome.

### 7.6.1 The Perishable Nature of Design Science Research Framework

Design science aims to deliver a "satisficing" outcome to the stakeholder; however, stakeholder views and the environment in which the company functions are not fixed. Feigenbaum and McCorduck (1983) viewed design science as "perishable" since the artefact environment is in constant flux. As such, what is satisfying today may not be satisfying or even appropriate tomorrow in the context of social norms and legal regulation.

When a new requirement arises, practitioners may be tempted to modify the outcome of design science, i.e., the employment selection artefact, without employing appropriate design approaches and methodologies. Suppose modifications are made to ensure personal gain. In that case, a modification could create a significant gap in the system, corrupting the system’s ability to identify and remove subjectivity, and damaging the system, as subjectivity may be inherently integrated into the system; therefore, continuous system improvement is needed. According to Kaplan (1964), considering knowledge by extension and benefit from the ITIL Continuous system improvement framework, the study also benefits from the developed system that employed design science as knowledge by intention. Thus, the study employs an open loop that is considered a trigger mechanism for the company that uses the system. The company then trigger the research institute to modify the research according to this gap.

Winter (2008) argued that a methodological framework is needed to ensure quality when using design science. Thus, a structured methodology needs to be engaged, as part of an open control loop, when the artefact no longer satisfies the requirement to mitigate subjectivity and bias in the employment selection process (Hinds et al.,1997).

Nevertheless, a modification to Hevner's framework in an information system was deemed necessary. Several scholars highlighted this point; for example, Feigenbaum and McCorduck (1983) viewed design science as "perishable" as it is evolving. Consequently, the "exaptation" of an open loop, which includes the control component for the loop, becomes the approach to continued system improvement in design science research (Argyris, 1974; Jong, Kolthof and Pieper, 2008).

Indeed, Winter (2008) argues that a methodological framework is needed as quality criteria for design science; thus, the open loop also functions as quality evaluation. Moreover, the open-loop works as a secondary analysis when the control loop indicates a need, with several scholars supporting the notion of a second analysis (e.g., Hinds et al., (1997); Szabo and Strang, (1997); Thorne, (1998). Additionally, Hevner and Malgonde (2019) **“suggested that extra R is needed in design science due to resonance”**; however, no proposed mechanism or further explanation was created; in fact, extra R will work only as a quality cycle but not a continuous system improvement cycle because it is inside the design, so it is useless due to design cycle. This means the suggestion will not remove resonance. This is why the above phrase remains one paragraph in an article with no implementation. See the illustration below as imaginary if an extra R is added to the design where it will work only as quality criteria. However, the illustration below demonstrates the open-loop substitute for this suggestion as a continuous system improvement method.

“Rapid technological advances can invalidate design-science research results after they are implemented effectively in the business environment before adequate payback can be achieved by committing organisational resources to implement those results” (Hevner, 2004). This is a significant problem and risk for businesses since the output of design science is only appropriate and valuable when considered relevant. Hevner openly accepted that design science is perishable, i.e., that the value of the design solution may reduce over time.

The study suggests that a modification to Hevner's framework is necessary; accordingly, the researcher employs an open loop, taken by extension from the ITIL framework, which triggers DSR cycles in response to the identification of either

A gap or error in the selection artefact or company, organisational, or social changes (for example, new legislation) resulting in loss of ‘satisfaction’. Therefore, the "exaptation" of an open loop, which includes the control component for the loop, supports continued system improvement (Argyris and Schön, 1974).

## 7.6.2 Unperishable Design Science

The DSR redesign was re-initiated to support the adaptation and evolution of the use of employment selection artefact until satisfaction is achieved. Transformation of the design science framework, i.e., to remove its perishable nature, is achieved by integrating the epistemology of open loops. In other words,

integrating an open loop triggers the artefact redevelopment when it fails to satisfactorily remove bias and subjectivity within the employment cycle.

Within Hevner et al.'s DSR framework, no mechanism exists to monitor the effectiveness of the outcome artefact and (as required) trigger solution artefact redesign. The researcher proposes augmenting Hevner et al.'s design science with an additional loop triggered by the identification of a perishing artefact; in context resulting in the existence of subjectivity and bias in the employment selection process. The inclusion of this loop means that design science is continuously engaged in the monitoring of artefact satisfaction. If triggered, scholars can guide the development of a better system; in line with the typical design science methodology approach.

Figure 7.3 shows how Hevner et al.'s DSR framework should be used as a methodological wrapper around the selection artefact to remove the change of the artefact perishing over time. This approach reshapes design science, supposed someone argues what about if the researcher himself perished. Still, the institute that employs the artefact can employ another researcher to implement the new requirement.

According to the Sage 2020 report, "the changing face of HR," after surveying 500 senior HR leaders highlighting that new HR roles will be needed, like Analytics and People Science, behaviour scientists and more. So those researchers can be employed using the same methods to develop the new system if a new requirement arises.

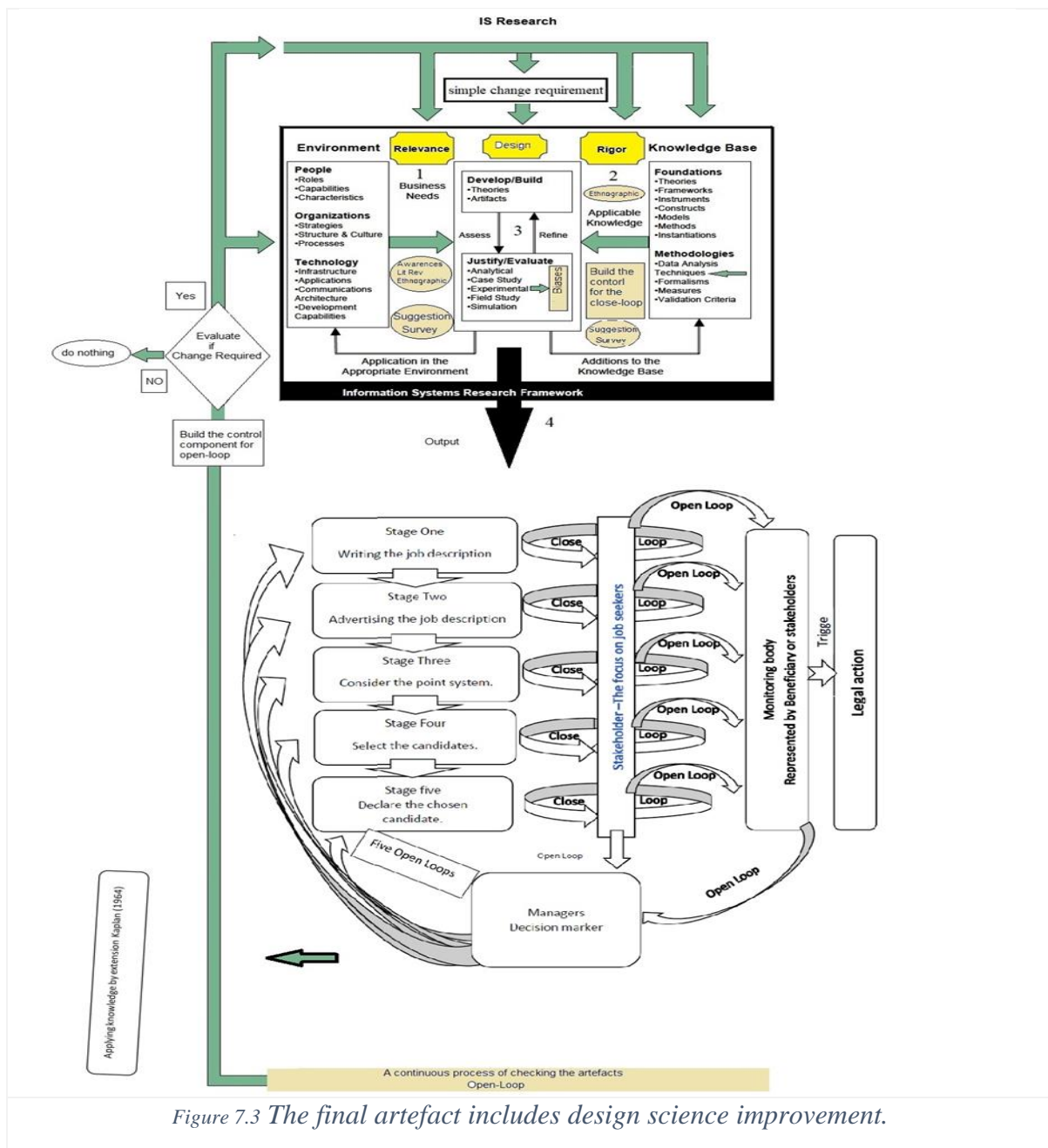


Figure 7.3 The final artefact includes design science improvement.

The researcher suggests that, once the artefact has been produced, as modelled in this thesis, additional continuous checking is required to ensure that satisfaction remains. If stakeholders identify problems with the employment selection artefact, then an official evaluation is necessary to determine whether an additional iteration of the artefact is required.

If the evaluation implies no change is required, then no change occurs. If problems are identified, and an evaluation suggests that change is required to the structure of the selection artefact, then Hevner et al.'s design science research framework is initialised; with a simple change in requirement. When re-initialised, the DSR framework will systematically pass through each step, i.e., relevance (1), rigour (2), design, and justify (3), until the output artefact (4) incorporates the newly identified change

requirement and achieves a satisficing state. Assuming that a satisficing state can be achieved, the design science research framework ends. The new artefact will then be used, and the monitoring and evaluation process will start until satisficing fails and the process is triggered again.

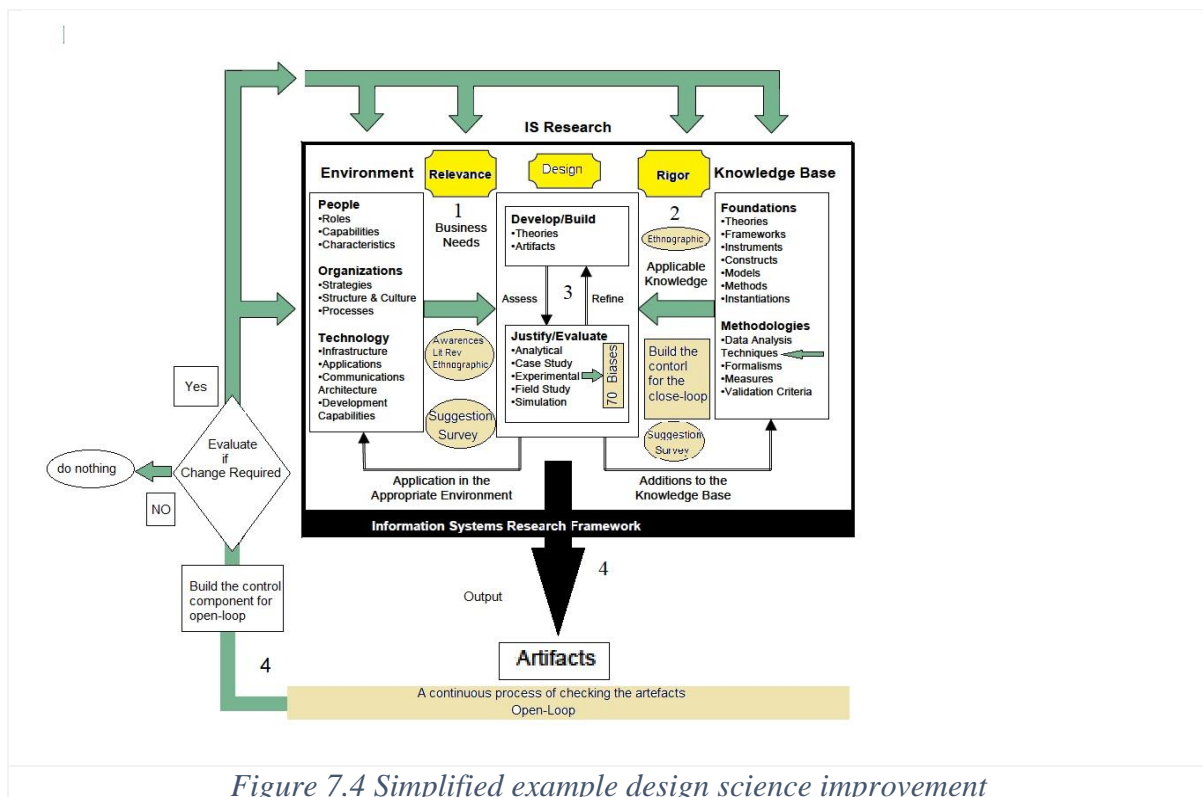


Figure 7.4 Simplified example design science improvement

Although developed specifically for use in this thesis, the wrapping of Hevner et al.'s DSR framework with open-loop feedback to prevent the perishing of the artefact could theoretically be used by anyone looking to apply a DSR methodology in a volatile or dynamically changing environment. In comparison, the artefact's relevance is likely to perish quickly over time due to requirement changes. The proposed solution allows iterative evolution of the artefact, allowing the artefact to respond quickly, yet systematically, to changes in the environment. As such, the researcher considers introducing this 'adapted version of Hevner et al.'s DSR framework' to be an additional and beneficial contribution identified as part of this research.

## 7.7 Conclusion

In this section, the researcher undertakes the build and justify stage of Hevner et al.'s design science methodology, incorporating several component parts from chapters 4 to 6 in the following:

1. The final employment selection artefact (see Figure 7.5)
2. A final artefact, which wraps the solution artefact in a DSR methodology, incorporates an additional open loop to check artefact satisfice continuously. The final artefact (see Figure 7.3) provides a generic 'vanilla' solution to mitigate subjectivity and bias within the employment selection lifecycle.

The existence of the open loop means that the artefact will trigger or reactive the DSR if satisficing fails to occur due to the perishing of the artefact. Hevner et al. (2004) suggest this fact; however, yet to mitigate the situations; thus, the system will self-evolve to re-align to changes in social norms and government regulation.

The use of complex loops and transparency, within and **outside** the selection artefact, facilitates the systematic development of the job description, the advert, the point system, the verification of evidence processes, and stakeholder feedback used in column one of the solution artefact (as discussed in chapter 6) – see figure 7.4 and 7.5. Suppose any stakeholder identifies a problem, subjectivity, and bias. In that case, this can be managed within the second column of the solution artefact, allowing improvement and alteration of the job description, the advert, the point system, the verification of evidence processes, and stakeholder feedback until either.

- i) The issue of the problem been rectified, or
- ii) Justification is developed to explain why a specific decision has been made. Suppose issues are perceived to be harmful or illegal. In that case, these issues will be identified within the third selection artefact column, which contains relevant monitoring bodies to check the effectiveness of stakeholder activity.

Process improvements, from columns two and three, pass back to managers and decision-makers who implement changes to work towards such issues not happening in the future. If the independent monitoring body can highlight and evidence inappropriate action, then legal steps should be taken to recompense any injured parties. By combining the last two steps, i.e., feedback to managers, the organisation is openly projecting a willingness to change and accept responsibility for its actions. By having an open and psychologically safe environment, i.e., allowing issues to be transparently discussed and highlighted without fear, the organisation is also increasing their ability to reduce and remove the existence of such problems, subjectivities, and biases from within the organisation processes.

The solution and final artefact have been designed as a vanilla mechanism for use in information-rich companies. This does not mean, however, that some degree of customisation will not be required to ensure optimised use in specific organisations. Customisation requirements can be identified within the augmented DSR framework's open loop, thus allowing artefact evolution over time.

By incorporating effective open loop evaluation of any DSR's artefact, we provide a solution to the erosion of artefact relevant and support the move to contextual, continuous improvement. Accordingly, the researcher puts this forward as another key contribution to the work presented in this thesis.

The next chapter is the final practical chapter in this thesis, which examines the artefact and the methodology improvement from a usability perspective using formative evaluation.



## Chapter Eight Evaluation

### 8.1 Introduction

This section evaluates the acceptance of the proposed final artefact (see Figure 7.3) for use by knowledge-intensive companies by i) presenting and justifying the approach used and ii) having stakeholder evaluate their acceptance of the developed artefact.

The Design science contains two paths, “Build and Evaluation cycles” or “Build and Justify cycle”. Since the study employs the path “build and justify cycle” while building the artefact, it involves three different aspects when justifying each approach: Humans, Society, and Technology in the sociotechnical-materiality domain.

This approach that involved humans in interpretivism ethnographic employed earlier does not help build new physical artefacts but a conceptual system called artefact, employed by Hevner et al. (2014). Such an approach is used by positivism or critical as well. Still, scholars argue that evaluating design science artefacts is essential, according to March & Smith (1995). So, theoretical evaluation in design science closely matched according to Gregor and Jones (2007); therefore, in the current study, each theory employed in the design has been justified and tested with a clear outcome.

In general, the central concept is an “explicit-automated or semi-automated system supervised by different monitory bodies who are the beneficiary in spotting issues”. In comparison, the current in-use system or job market approach and employment selection process becomes like neural network programming in AI. Each role is connected to other jobs, so the bias is created automatically due to node triangulation or feedback. Scholars describe it as a systemic bias; this is the case when a company asks for past salaries and evaluates people accordingly, whereas the evaluation should be based on knowledge and job budget (Yearby, 2010; Kistner, 2020).

This section focuses on assessing the artefact as it is a crucial part of the information system domain (March and Smith, 1995; Hevner et al., 2004; Vaishnavi and Kuechler, 2004). Therefore, the first step elaborates on the evaluation literature and briefly demonstrates previously identified assessment steps. Second, explain the chosen method, formative assessment as the second stage evaluation, and why this method is contextually most appropriate for this study. Finally, this section confirms the final artefact as proposed to reduce bias in the employment selection domain. The artefact can be employed by a knowledge-intensive company or a

company using the ITIL framework to modify the artefact as a continuous system improvement to make it suitable for use and purpose in any such organisation concerning utility.

## 8.2 Evaluation Assessment Methods

This section reviews how other scholars evaluate artefacts and discusses several methods to understand the “what, why and how” other researchers evaluate their artefacts. This step assists the author in choosing a suitable approach to employ in the final artefacts for this study.

According to Hevner et al., the essentiality of the evaluation required that researchers rigorously consider: i) the utilities, which is the usefulness of the artefact; hence, the researchers should examine how useful the final artefact is in mitigating bias in the employment domain; ii) the quality, which is the match between methods and measurement; and iii) efficacy, which is the performance of the intervention in the design of the artefact using reasonable evaluation methods (Hevner et al., 2004). Similarly, considering the performance and employability of the artefact involving the environment (people, organisation and behaviour) are needed to integrate with people’s behaviour (Vaishnavi and Kuechler, 2004).

The evaluation literature presents multiple evaluation methods and techniques. Remenyi (1999) introduces and categorises various evaluation techniques, focusing on why, when, what and how to evaluate. Remenyi (1999) explicitly describes the distinction between ex-ante and ex-post for design science use. Ex-ante refers to the predicting of an event or estimating an outcome. Ex-post relates to consideration after the event, i.e., reflection, allowing ex-post evaluation to examine actual data from the artefact. Another categorisation discussed by Remenyi was formative evaluation (monitoring assessment to facilitate feedback and improvement of the outcome) vs summative evaluation (credited assessment to provide a final quantitative assessment of outcome quality), which is commonly used in many domains like education. Remenyi also discusses subjective techniques (interpretative) and objective (positivist) evaluation techniques, which are often linked explicitly to qualitative via quantitative techniques.

According to Gill and Hevner (2013), one precise method is needed to evaluate utility, fitness, and employability, which is the primary interest in this chapter. However, occasionally, each stage requires a different evaluation technique and approach when considering coupling evaluation which is the same as the UML principle. In this case, each stage or component was previously evaluated separately through different approaches, including justification (see chapters 4 to 6) and connected (see chapter 7), resulting in a new outcome as suggested by (Vanderfeesten et al., 2007; Sonnenberg and Brocke, 2012); so, stage one evaluation used “justificatory knowledge” methods and express why it was used before involving it in the design.

Cleven et al. (2009) also supported the above approach after evaluating several artefacts and approaches, as shown in Figure 8.1 and demonstrated the evaluation based on variables and value. The variables have twelve criteria: a qualitative or quantitative approach, then artefact focuses, and so on,

see Figure 8.1. the developed framework highlighted that the artefact evaluation should not be considered an isolated process but should be considered systematically from the beginning of a design process. Like theory-based evaluation, where the framework attempts to evaluate change at each stage. Chen (1994) introduces Cleven's theory as a comprehensive evaluation framework to bridge method and theory-oriented and determines how well the program or the project work. The theory concerning “why the program is working and how well the program is working” is based on process, observation, and outcome produced. This approach is adopted in stage evaluations for the artefact in this thesis.

Variable	Value				
Approach	Qualitative			Quantitative	
Artifact Focus	Technical		Organizational		Strategic
Artifact Type	Construct	Model	Method	Instantiation	Theory
Epistemology	Positivism			Interpretivism	
Function	Knowledge function	Control function	Development function	Legitimization function	
Method	Action research	Case study	Field experiment	Formal proofs	
	Controlled experiment		Prototype	Survey	
Object	Artifact			Artifact construction	
Ontology	Realism			Nominalism	
Perspective	Economic	Deployment	Engineering	Epistemological	
Position	Externally			Internally	
Reference Point	Artifact against research gap		Artifact against real world	Research gap against real world	
Time	Ex ante			Ex post	

*Figure 8.1: Variables and values for the evaluation of DSR artefacts Cleven et al. 2009*

Gacenga et al. (2012) developed a framework, expanding ideas proposed by Gill and Hevner (2011), to evaluate artefacts in design science by applying the guidance of the fitness-utility model. The guidance aims to answer the question, “How well does the artefact work?” which is precisely what this study intends to evaluate. Thus, to examine how well artefacts work, the researcher, as proposed by Gill and Hevner (2011), examines how experts agree with the artefact; in other words, do experts accept the suggested final artefact?

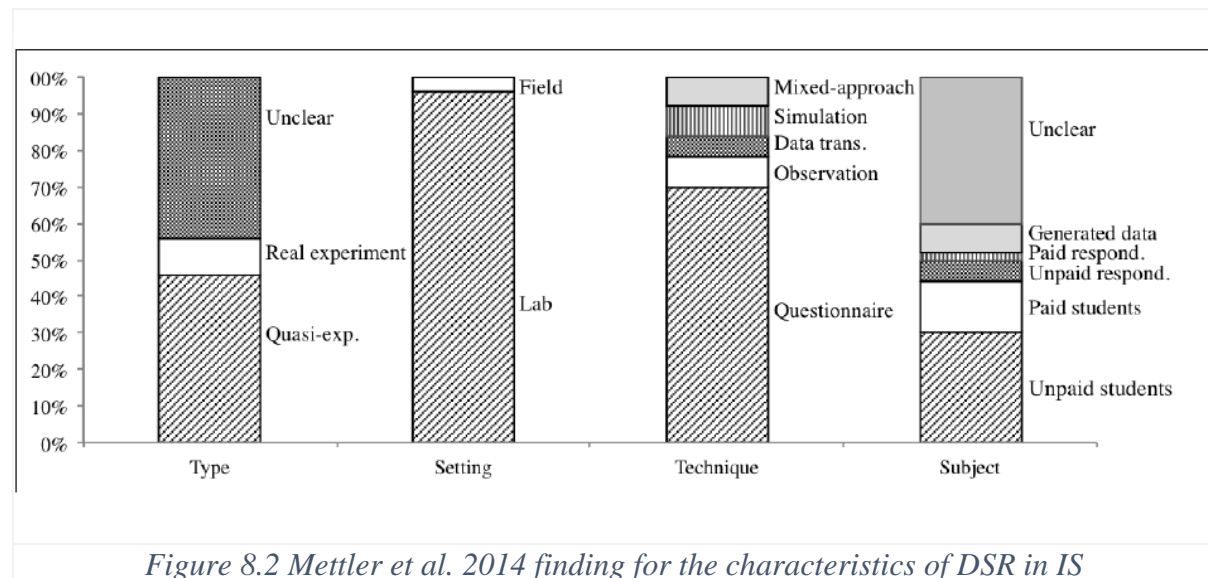
Another example is Venable et al. (2014) developed a framework called FEDS with evaluation strategies that emphasise creating a bespoke evaluation strategy that maps specific criteria for evaluation by considering different perspectives like summative via formative evaluation with a naturalistic via artificial environment.

The FEDS framework has four evaluation steps based on two dimensions: functional purpose, including “formative vs summative evaluation”; accordingly, the researcher should identify whether the evaluation should be fulfilled in a realistic or natural environment with real users or an artificial environment in which means acts or suggested environment; thus, other approaches for evaluation paradigm includes “naturalistic vs artificial evaluation”.

Another approach emphasised that the evaluation depends on the artefact type employing the FEDS framework, whether methods, instantiation, or construct, as Peffers et al. (2012), so the evaluation

should be adjusted according to the artefact type and outcome. Also, Venable et al. (2004) adopted a similar approach to the FED framework considering the artefact type but then enhanced the work of Pries-Heje et al. (2008), Venable et al. (2012) and Peffers et al. (2012). In contrast, Hevner et al. (2004) suggest a plurality of several techniques like case studies, controlled experiments, simulation, prototyping, and informed arguments depending on the artefact.

Mettler et al. (2014) analysed articles from 2005 and 2011 and concluded that different objectives and methods, as shown in the diagram below, are self-explanatory (See figure 8.2).



The diagram below shows another approach worth discussing, called the stakeholder approach (Mark & Shotland, 1985; Greene, 1987), which involves the stakeholder in the evaluation compared to the research approach or scholarly assessment. Both have advantages and disadvantages, as listed in Figure 8.3.

This approach taught us that it is essential to balance stakeholder and research approaches as the current system is developed for people and should be accepted by practitioners as system users who are managers or recruiters.

Stakeholders approach	Research approach
<ul style="list-style-type: none"> <li>Research control by program sponsors</li> </ul>	Driven by theory
<ul style="list-style-type: none"> <li>Researcher limited with program sponsors.</li> </ul>	Do not consider stakeholder goals
<ul style="list-style-type: none"> <li>The outcome could be biased</li> </ul>	The outcome could be less biased.
<i>Figure 8.3 Stakeholders approach</i>	

Deploying the research approach could have funding issues when considering this approach and ignoring stakeholders; in this manner, first, the participant may be uncooperative; second, the next project

may have funding issues, and several problems could arise. Alternatively, suppose science procedures are neglected and a stakeholder approach deployed; in this way, the evidence may be compromised, research generalisation becomes harder, research replication becomes challenging and much more. Therefore, an integrative approach balances the two approaches and considers responsiveness to stakeholders' concerns with reliable outcomes and generalisable results. This is recommended because the development processes employ a scientific approach compared to stakeholders' approaches or practitioners.

Kirkpatrick (1959) suggested that the Four-Level training evaluation model examines satisfaction, learning, transfer or behaviour, and ROI or impact. It also suggested that it is not necessary to test the four levels. This is similar to Cleven and Chen's views; it is precisely the same case in the development of the artefact, as the justification of each process is highlighted and justified. Those examples enlighten the researcher; although the study conducted a meticulous evaluation according to the above, most steps were built based on kernel theory that is tested with a profound outcome.

Accordingly, the author adopted several evaluation techniques to ensure the evaluation.

Firstly, in section 8.3 as an example, the artefact is critically examined against the seventy-seven biases that impacted employment fulfilled in the Rigor cycle. In a process that aims to reduce load and complexity, the researcher focused only on biases that failed in the first testing cycle - as there is no need to test biases already mitigated in the first cycle; thus, a critical examination aims to highlight possible risk areas.

Secondly, in section 8.4, the researcher presents the final artefact to domain stakeholders and experts to understand issues and sentiments concerning whether stakeholders would accept the proposed solution. And so on.

### 8.3 Bias Checking first evaluation approach.

Since we have more than one evaluation, below are the outcomes of the two primary evaluation approaches for the first stage evaluation; consider that other methods employed were justified in the past sections. Failed biased were systematically considered against the final artefact.

The first approach is the qualitative approach, as shown in Figure 8.1, which examines the system's bias, employing a process that aims to avoid researcher bias, as a human tends not to see their mistakes, especially when they coding, programming, or do a detailed task required multiple thinking, Williams et al.(2000). Therefore, a third party has been selected with the characteristic that the selected person should appreciate bias removal from the employment, has higher qualifications, and has been searching for a role more than three times.

The selected person, also based on availability and the chosen person has an MSc degree in informatics, given the biased definition and/or story, was asked to examine the story or definition in the module. This step is a double-checking mechanism to ensure quality, as Winter (2008) recommended. This

approach also considers a second checking or analysis for the system as recommended by (Hinds et al., 1997; Szabo and Strang, 1997; Thorne, 1998).

The researcher verified the spotted errors by the second party and double-checked them with the outcome below 1-5.

This step was necessary to check if the system successfully controlled the bias, especially for the hard-to-spot bias, like the Anchoring effect bias, which could happen outside the process and impact inside the process

The researcher found several possible issues in the proposed system in the first evaluation approach:

1. Managers might be able to cheat the system if they first agree with their superiors that they are going to cheat the system and if the superiors include imaginary requirements, such as requirements that allow the manager to guide selection in favour or subjectively away from specific characteristics.
2. If the monitory bodies (for example, the small law firm) are connected to these managers, then the monitoring body could be influenced to overlook specific subjective or biased actions. However, this is almost impossible if the set-up is explicitly and free for any organisation to join. Still, the independence of monitory bodies may be lost, biases ignored, and process correction untriggered; If a company does not seek a truly independent monitoring body, then it opens itself to significant reputational damage. Furthermore, It is highlighted that there is no incentive for a monitoring body, which works on a no-win, no-fee, claim basis, to monitor an organisation supporting individuals according to the law.
3. If the job advert did not obtain many job seekers, then only a limited number of people critically reviewed the advert and whistleblowing false information. In many countries, it is a legal requirement to advertise all roles. However, it may be tempting for the organisation that is trying to manipulate the system, particularly towards hiring an internal or favoured candidate, to minimise the dissemination of the advert, thus reducing the chance that large numbers of people will spot bias and question the role. The advert might be transparent but must be found first to allow interaction.
4. If a practitioner manipulates the system without considering all aspects, the influence may impact confounding variables, i.e., have a negative impact on other stakeholders and all information within the process. As such, appropriate change management must be used to ensure that the impact of change can be effectively understood and managed.
5. If a job seeker takes on the role of a whistle-blower, then it is essential that they can effectively explain the technical bias and express clearly where this bias or issue is in the process and why they are raising the alarm. If more than one person raises the same alarm, this issue could be

mitigated automatically, concerning there is no manipulation; this could be identified through the geographic IP address and AI system. Suppose the same person repeatedly raises the same or multiple issues, such as the boy that cried ‘wolf’. In that case, the organisation is at risk of ignoring or dismissing the value of the raised objections. Therefore, each case should be taken individually after the whistle-blower highlights why, when, and How.

All of these issues should be considered when implementing the employment selection artefact, and corrective action should be taken to minimise the impact of these issues.

## 8.4 Domain Stakeholder and Expert Interviews

### 8.4.1 Formative Evaluation of Artefact Acceptance

Remenyi (1999) and Dick et al. (2009) stated that formative evaluation examines how well the artefact works by introducing the artefact to practitioners and scholars in the domain. So, the researcher developed a presentation explaining the ideas and steps, which the researcher presented to stakeholders in the hiring process and academic scholars in the domain. A follow-up interview was used to capture stakeholder feedback. Interviews were conducted either via the internet by phone or face-to-face. Permission was gained to record all interviews so that the researcher could focus on the interviewee instead of documenting responses. A snowballing process was used because it helps allow the interviewee to recommend others who might be able to comment/help the researcher. In total, eight in-depth interviews were conducted to gain feedback on the final artefact. Interpreting interview data allowed the researcher to critically assess user acceptance of the artefact through consideration of experts and peer review comments.

There are several interview techniques, for example, dyadic interviews or focused groups, were considered; however, the study employed the Socratic interview technique, i.e., the Elenchus method, which allowed the researcher to understand the deep reasons for participant rejection or acceptance. The researchers explained the problem domain and the artefact within each interview. The researcher then questioned the expert to determine whether they would accept or reject the system (and why they gave that answer, i.e., what criteria impacted stakeholder perception) after understanding the deep meaning, a modification process to the artefact in place.

The researcher determined that the best way to evaluate the criteria was through thematic analysis because theming the comments as either positive or negative highlights both the causes of rejection and the sentiment impacting design acceptance. The following sections explain the data collection and justify the thematic analysis method.

### 8.4.2 Interview Data

The interview recordings were converted to textual transcripts using built-in speech-to-text captioning in Microsoft Teams. The captions ease the analysis process because they divide the paragraph into a sentence with video to support the researcher in synchronising human body language and stakeholder



sentiments. Accordingly, the reviewer focused on interpreting the problem within the video stream, i.e., to eradicate noise and irrelative information.

This study considers factors that impact the system's acceptance in real life. This study used eight selected interviewees to highlight the majority of key issues impacting the final artefact. Although there is no precise measurement of how many participants are needed. For example, Nielson (2000) suggested five users in user testing. Dworkin (2012) suggested between 5-50, with the number dependent on several factors, such as the "quality of the data", "study scope", "topic nature", et cetera. Creswell (2007) suggested a sample of 3-5 in a case study. Krueger and Casey (2009) suggested 5-10 samples in a focus group interview.

The study concerns the outcome artefact's acceptance, intending to collect feedback from eight specialists because eight is the upper-mid balance between 5 and 10. Critically it is essential to work towards data saturation, and in this study, saturation, i.e., when new participants do not provide new ideas or information.

The interview started with the researcher's presentation, followed by questionnaires, repeated using snowball sampling for eight participants until data saturation occurred. See Appendix E for presentation slides.

The data was collected, and thematic analysis was conducted using the following steps: i) familiarisation with the data, ii) coding of the data, iii) initial themes creation, iv) examining the themes, v) naming and defining the themes, and finally vi) writing the outcome.

Thematic analysis was chosen as the best approach for several reasons: 1) according to Braun and Clarke (2006), thematic analysis creates a trustworthy outcome; 2) thematic analysis is a well-known method and easily understood and grasped by the researcher; 3) thematic analysis is useful to understand the hidden meaning, and can generate themes concerning unspoken words; 5) thematic analysis allows critical consideration of subjectivity issue, for example, trustworthiness in quantitative research (Nowell et al. 2017).

### 8.4.3 Use of Thematic Analysis with Sentiment Analysis

The study is a deductive thematic analysis using a semantic approach that includes extracting the explicit content of the data. Thematic analysis helps the study understand the recorded interviews to identify whether domain experts and academics rejected or accepted the system and what they suggested to improve it.



The Thematics analysis approach employed in this evaluation involved eight domain experts using a snowballing technique, which means each expert referred to the other expert. The total of candidates involved in this process is eight experts, with the demographic data

in Table 8.1. The selected persons should be a scholar in the domain or HR managers or managers involved in hiring employees.

Subject ID	Role	Industry	Gender	Relevant Experience	Qualification
1	Junior Scholars in Informatic working at the University for two years	Informatics	male	Three years	PhD
2	Director of HR	Mobile	Female	Five or more	unknowns
3	Director at IBM	IT	Male	15 or more	MSc
4	Doctoral of Informatics and bank Managers	IT	Male	Ten or more	PhD
5	Senior Scholars who supervised PhD thesis	Informatics	Male	Ten or more	PhD
6	Hospital manager	Medical	Male	25 or more	PhD
7	Senior Scholars who supervised PhD thesis	Informatics	Male	15 or more	PhD
8	Junior scholars in informatic	Informatics	Male	Three or more	PhD
<i>Table 8.1 Demographics Data</i>					

The interview has been recorded, and Microsoft voice caption is enabled, so text and voice are available as well as hidden meaning through video and body impression. The researcher should be familiarised with the data and collect the data in an Excel file, then highlight them to extract the data from the video, later represented in the tables below.

The outcome snapshot is as below(see table 8.2): **Four interviewees appeared to agree** with the system, **three disagreed** with the system, and **one took a moderate** position (i.e., agreeing with the idea in principle but unsure if managers would be happy to give up the privileges given to them in the current system).

The researcher separated stakeholders into groups related to

1) Positive reflection on the outcome of the Thematic Analysis, referred by positive code (see Table 8.2 and 8.5).

2) Moderate reflection on the outcome of Thematic Analysis referred by Moderate code (See table 8.2 and 8.4), and

3) Negative reflection on the outcome Sentiment outcome of Thematic Analysis referred by Negative code (see table 8.2 and 8.3),

Each theme group has a number of sub-themes (presented in the subtheme column) linked to relevant body language expressions. In the ‘Negative Sentiment outcome of Thematic Analysis’ group, sub-themes included: participants believing bias is unavoidable (i.e., part of human nature and societal and legal systems); participants believing that there is no bias in the process of employment selection; a belief that experience has a higher value than knowledge and that doing the job is key; humans with experience of employment selection will be able to identify issues and problems with the candidate better than the use of a points-based system.

Additional comments concerning body language can be seen in Table 8.1. In the ‘Moderate Sentiment outcome of Thematic Analysis’ group, the primary concern was not with the issue of bias removal but on whether implementation of the system was viable in practice. In the ‘Positive outcome of Thematic Analysis,’ groups thought the system appeared robust; however, people would still attempt to falsify information and manipulate the employment selection process to employ friends. All participants provided some suggestions points for improvements to the system.

The above points are the themes that emerge from the interview and conversation with the expert; as a conclusion to the themes and phrases that demonstrate different strong views. Some experts believe in continuous system improvement and fixing societal issues; some believe society is never fair since humans were created. The reason for the inference is that some people contributed to the system to reach perfection, and others who reject the system believe that bias and discrimination will continue. The researcher, at this point, believes that society could be fair if there is continuous system improvement and collaboration.

The scholars and experts who contributed to the system believe in a fairer society where others think the problem could be more significant and bias could happen after employment, as explained below.

Table 8.2 The Outcome of the Themes

Sentiment	Examples
Q1 The principles of bias mitigation	
Negative	<ul style="list-style-type: none"> <li>• Believe biased is human nature and should be untouched (Participant 1)</li> <li>• Believe there is no bias in hiring, but after hiring (Participant 2)</li> <li>• Don't believe in bias (Participant 3)</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>• Happy with the idea of bias removal but not sure from the system aspect unless it is tested (Participant 4)</li> </ul>
Positive	<ul style="list-style-type: none"> <li>• Agree with the bias removal and contribute to the system (Participant 5)</li> <li>• Describe the system is useful for hospital doctors hirings medical assistance (Participant 6)</li> <li>• Agreed with the bias removal and suggested developing the system (Participant 7)</li> <li>• Agreed with the idea (Participant 8)</li> </ul>
Q2 The principle of the point system	
Negative	<ul style="list-style-type: none"> <li>• Disagree with the point system as it is useless. (Participant 1)</li> <li>• Reject the point system (Participant 3)</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>• It could be useful, but not sure how or understand the proposed point system (Participant 2)</li> <li>•</li> </ul>
Positive	<ul style="list-style-type: none"> <li>• Agreed with the point system but not sure how it will be used. (Participant 2)</li> <li>• Agreed with the point system and contributed to the clarity of writing (Participant 5)</li> <li>• Describe it as useful (Participant 6)</li> <li>• Agreeing with the point system and considering it a contribution, and discussing the technical aspect also provided several corrections in the system. (Participant 7)</li> <li>• Support the point system and agree with the idea of 2 systems, high and low systems but still believe that people will continue hiring their friends (Participant 8).</li> </ul>
Q3 The Entire system	
Negative	<ul style="list-style-type: none"> <li>• Bias cannot be mitigated (Participant 1)</li> <li>• Reject the system as it is a long process (Participant 2)</li> <li>• Reject the system and believe that he can assess candidates by looking at them and seeing their history. (Participant 3)</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>• Neither agree nor disagree (Participant 4)</li> </ul>

Positive	<ul style="list-style-type: none"> <li>• Agreed with the system and contributed to the system (Participant 5)</li> <li>• Agreed with the system and Belief the system could be helpful for doctors who hired other medical assistance staff. (Participant 6)</li> <li>• Agreed with the system, support the knowledge codification system, and consider it a contribution by itself. (Participant 7)</li> <li>• Like the system and describing it as a challenge also suggested that the system should be explained, not depend on the model. However, believe that people will continue to hire their friends (Participant 8)</li> </ul>
Q4 Body language and sentiment outcome	
Negative	<ul style="list-style-type: none"> <li>• Believe the law is biased (Participant 1)</li> <li>• Believe experience has a higher value than knowledge, Also, Do not care what a person knows, only concern for someone to do the job. (Participant 2)</li> <li>• Body language shows that the interviewee believes in himself only, and he is authoritarian and Unable to identify what are tacit knowledge and the value of knowledge compared to the experience. (Participant 3)</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>• Belief in soft skills where the study considers this as an unstable parameter; however, the candidate remains neutral positions. (Participant 4)</li> </ul>
Positive	<ul style="list-style-type: none"> <li>• Happy with the idea (Participant 5)</li> <li>• Like the idea (Participant 6)</li> <li>• Happy with the idea (Participant 7)</li> <li>• Support the idea (Participant 8)</li> </ul>
Q 5 Agree with the modification of the Hevner method	
Negative	<ul style="list-style-type: none"> <li>• Disagree with the modification as belief methodology should not be modified. (Participant 1)</li> </ul>
Moderate	<ul style="list-style-type: none"> <li>• Agreed with the idea but not sure due to testing (Participant 4)</li> </ul>
Positive	<ul style="list-style-type: none"> <li>• Belief it is a strong contribution to the work (Participant 5)</li> <li>• Encourage the idea (Participant 6)</li> <li>• Agreed with the idea (Participant 7)</li> <li>• Agreed with the idea (Participant 8)</li> </ul>

Thematic analysis in this thesis is used as a semantics approach aimed at evaluating the acceptance of the developed artefact or model in real life; however, the third subtheme applied the latent approach desire to read into the subtext and assumptions underlying the data.

## 8.5 Discussion

In general, we measured participant acceptance of the final artefact in real life. The system gained the acceptance of three scholars in informatics and one practitioner (a medical doctor and a hospital manager) involved in hiring medical staff. The idea of bias reduction gained wide acceptance. The medical doctor considers it essential to have iteration when hiring medical staff, such as a nurse. This interviewee describes the presence of loops as helpful when someone is “bluffing”. The point system also gained wide acceptance, even from two participants who rejected the system in general, i.e., i) the interviewee who believes there is no solution for biases and ii) the interviewee who focused on assessment based on soft skills; although this study considered soft skills as unstable parameters and selection criteria.

The main reason interviewees rejected the system was their preference concerning hiring philosophy. There are multiple views concerning hiring philosophy, for example, team fitness or diversification, and each has advantages and disadvantages. This study aims to remove subjectivity, accepting “role and responsibility” and “knowledge” as the main factors; however, many participants had a strong alternative view. For example, the HR Manager insisted that bias comes after hiring, even though literature shows how hiring decisions can be impacted by name, candidate weight, accent, gender, et cetera.

The list is extensive, which means rejection of the importance of bias in employment selection has no solid foundation. The second gap discovered was the participant’s lack of knowledge concerning the definition and inability to recognise the distinction between knowledge and experience. Winner mentions that 70% of managers hire based candidates on chemistry, instinctive feelings, and likes or dislikes. Few interviewers are willing to accept that the person they dislike may be the best candidate for a given job (Winner, 1996). Accordingly, one interviewee rejected the system because our solution implies that there are more biases associated with experience than knowledge.

Many comments, even concerning employer experience, suggested a desire to maintain a considerable subjective interpretation of candidate relevance. For example, “I do not welcome a system to remove bias, and I need to hire the one I like; I have been years in the job, and I can tell who is fit in a couple of words”. Managers focus much on the length of experience and cultural fit; managers were quite negative about not being free to select between candidates to maximise team dynamics and cultural fit. Culture fit is out of the study scope; however, the literature suggests that selection on culture fit does not support optimised bias mitigation.

The research knowledge and experience in chapter 5 as measurable factors, and as “you cannot manage what you cannot measure” (Drucker, 1994), it seems inappropriate to incorporate additional cultural and social complexities.

Within the interviews, we identified three views of bias: mitigation, rejection, or acceptance. The fourth person to reject the system was a researcher with a PhD degree working at a university. Interestingly,

this interviewee's view was one of acceptance, i.e., that bias was ubiquitous, and there was no way to control bias. This interviewee stated, "There is no way you can reduce bias; it is human nature". Although the researcher agrees that bias is human nature, much literature suggests successful bias mitigation is possible through transparency, openness, feedback, monitoring, and interaction and improvement.

The second observation of this individual was that the "law is biased!" suggesting that both the monitoring bodies and the legal system in place could be biased. This point was accepted as possible; however, transparency and iteration mean that poor monitoring is easily recognised within the system. The researcher has purposefully avoided using unmeasurable components in this research and the final artefact. If a company believes in unmeasurable components, then this system will not work for them, as unmeasurable components are, by definition, subjective. If such companies wish to use the final artefact, then they will have to rework the system using design science; however, the study does not promise optimised mitigation of bias if design science requirements are changed.

Another dissonance occurred with the fourth interviewee when discussing the knowledge codification process, i.e., externalisation conversion of implicit to explicit. Despite considerable knowledge in information processing and informatics, the candidate stated, "You can not convert tacit knowledge to explicit knowledge. I have a background in psychology, and there is no way, for example, you can convert human motion or secret sign". A plethora of research, for example, Fernandez et al. (2004) and Nonaka and Takeuchi (1995), discussed tacit knowledge codification and has shown it to be possible. Nonaka and Takeuchi (1995) raised this point that it was difficult for the knower to explicitly codify the knowledge; a qualified external stakeholder, however, should, given the resource, be able to express complex emotions, as demonstrated by the facial expression of Sophia (see figure 5.3) who can both understand (and codify) facial impressions and react accordingly. However, a "secret sign" fits under encryption, which is out of the study scope, but the exact mechanism could at least spot it.

Finally, regarding the modification of the methods, the fourth interviewee stated that it was not reasonable (or acceptable) to augment and modify Hevner et al.'s DSR framework; by adding a satisfying evaluation open loop.

Interestingly, Hevner, and Malgonde (2019), the creator of the augmented Design sciences methods framework, stated that "extra R is needed in design science due to resonance". The addition of the open loop (see figure 7.3) allows monitoring and evaluating the artefact's effectiveness and triggering redesign when required. This additional loop is required because time and evolution in the environment result in the developed artefact no longer 'satisficing' inline with environmental, organisational, and societal requirements changed. In light of one interviewee's academic background, the researcher was slightly surprised that this minor augmentation (not corruption) to the original design science

search framework was unacceptable because the researcher believes it is unacceptable to modify the unacceptably.

Although it was good to discuss the fourth interviewee's issues critically, the researcher believes the interviewee had accepted bias as ubiquitous and unavoidable. The researcher's view, the perspective of most literature, and the view expressed in this thesis are that although the bias is complex, it can be mitigated; and every effort should be taken to do so. The researcher accepts that bias is inherent in human nature due to the subjectivity of reality (Andersen et al., 2019), yet it is the very reason why the final artefact rejected certain inputs because of the clearly symbiotic relationship between subjectivity and bias. The researcher believes that appreciation of the existence of bias is a reason why every effort should be taken to remove it from the employment selection system.

## 8.6 Conclusion

The researcher was satisfied that the outcome was sufficient and appreciated the input, which is the aim of the formative evaluation to improve the final outcome.

The study discovered that some managers adopted a philosophical viewpoint that contradicts our design philosophy. The lesson learned is that this system is only helpful in an organisation and implemented by managers who understand the danger and the impact of bias on the corporation and are interested in removing biased from the process. This conclusion matches the statement of one interviewee's statement, "I do not believe managers will be willing to drop the power in their hand for a better system". This fact is absolutely right; however, some managers impacted by bias might be willing to accept such a system. We accept that the system does not support managers interested in subjective and unmeasurable parameters, such as unverified soft skills and experience. Still, via the use of the SECI phases (see Chapter 6), the final artefact does encourage the inclusion of i) externalised knowledge (converted from implicit to explicit) and ii) verified experience (in turns of knowledge and scope).

If the UK government were to, in a move to remove bias in UK organisations, mandate the implementation of the final artefact as a vanilla solution of employment selection – since the outcome of this research closely matches the UK government society inclusion policy. Thus, the researcher is confident that much bias, and illegal and inefficient practices, would be identified and removed.

Four scholars accepted the system as a whole; however, most interviewees, even those that rejected the system as a whole, accepted the concept of the points system. Since the issues raised and the rejection mainly was related to the interviewee's philosophical viewpoint, for example, a view that it was not worth trying to control bias, this system was seen to satisfy the research aim. The artefact outcome and the analysis were sufficient to demonstrate that the system contributes to world knowledge by guiding bias mitigation in the employment domain.

The study examines a social system that is employment selection and then identifies all parameters that impact the system. Later identifies the most critical parameters affecting the social system directly and

proposes a design science approach to develop a system employing technology, process, and management material to mitigate this dilemma.

Most academics generally understand the danger of bias and its impact due to their vast knowledge according to Chapin 2009 who stated when knowledge decreased, biased tends to increase. Generally, academics have authentic knowledge as the source of knowledge is peer review compared to practitioners whose knowledge comes from experience that could be influenced by bias. The data demonstrated this fact because some academics agreed with the system but believed that if someone in power needed to cheat, the system would do everything to benefit from it.

Therefore, from the principle of fairness, subjectivity becomes a dangerous component and could be used as a discrimination component based on like or dislike for an individual who takes their feeling to an extra level and does not separate justice from feeling.

This is human nature as some people who dislike people are motivated to harm them in contrast to others who follow the rule and the process of what should be expected for a fair society.



## Chapter Nine

### Conclusion

#### 9.1 Introduction

This final chapter considers the project problem, aim, and objectives, the key findings related to the research, difficulties facing the study, possible areas of improvement, summarises the PhD Journey and identifies areas associated with further investigation.

#### 9.2 Problem, Aim and Objective

A bias is a “systematic error in thinking” (Kahneman, 2011; 2021). This research investigated the domain of bias facing employment selection because research literature shows that bias affects both oppressors and oppressed. The employer, from their perspective, might consciously or unconsciously have a predefined idea of what kind of person, or specifically who, they wish to employ. Hiring someone, however, just because knowing them (better the devil we know) or because the candidate possesses individual and/ personality characteristics i) diminishes the organisations’ ability to benefit, via socialisation, from hiring the most knowledgeable candidate and ii) will, long-term, negative impact the knowledge and ability level of the organisation. Job seekers, from their perspective, soon come to appreciate that the traditional employment selection approach is significantly impacted by bias in preference of a specific gender, cultural and educational background, appearance, et cetera. Since management of these characteristics is outside the candidate's control, the job seeker becomes disillusioned with the employment selection process, feeling increasingly trapped, irrespective of their knowledge and abilities. The existence of bias in the employment selection process negatively impacts both stakeholders.

Chapter 4 stated that the research needed to:

- a) Understand subjectivity and bias in the employment selection domain,
- b) Develop a solution that employs complex loops represented by open and closed loops to mitigate subjectivity and bias in the employment selection process, and
- c) It needs to ensure that the proposed solution can maintain its relevance over time, i.e., or else the solution value is likely to perish due to environmental, organisational, and societal change.

Accordingly, the research objectives defined for this project are:

1. Understand managers' perspectives concerning subjectivity and bias in the employment selection domain - as managers and decision-makers are the control component within any monitoring cycle.
2. Understand the employment process to know when and where bias is created and where bias impacts the employment selection process, so employing the complex loop is possible.

3. Understand the issues of subjectivity and bias and their impact on employment, society, knowledge, culture, et cetera.
4. Understand the Job seeker perspective to identify the best location for employing feedback, interaction, and control mechanisms.
5. Understand job seekers' perspectives concerning subjectivity and bias in the employment selection domain – as the job seeker occasionally possesses much knowledge concerning aspects of the job role and domain, so mitigating this by employing the design theory.
6. Understand the process and technology so the study can interact with them successfully in mitigating the issue.
7. Develop a system that employs complex loops, and incorporates the knowledge gained concerning system issues to mitigate subjectivity and bias in the employment selection process.
8. Find out how other scholars in the domain mitigate biases, so it is possible to evaluate their work compared to this study.
9. Ensure that the proposed solution can maintain its relevance over time, i.e., the solution value is likely to perish due to environmental, organisational, and societal change.
10. Evaluate the proposed solution, using feedback from both scholars and domain experts, to assess the viability and acceptance of the proposed subjectivity and bias mitigation solution.

In summary, this study aimed to understand the existence of subjectivity, biases, and management mock bureaucracy and the impact on employment selection. Moreover, the study aimed to design systematically, via the employment of a design science research (DSR) framework, a prescriptive contribution to the knowledge and synthesis to mitigate subjectivity and bias in the employment selection process.

The design science research framework states that the outcome, called an artefact, should serve as a solution, with the design outcome (and component design and developed theory) contributing knowledge in this business domain. However, to overcome scholarly debate concerning theorisation essentiality in PhD thesis, the Design Science theory is embedded in the artefact itself. Furthermore, the design employs kernel theory adopted and modified from Nonaka and Takeuchi (1995), besides several supported theories like complex loop and computational thinking. Therefore, this study is not a “descriptive study” that aims to theorise or hypothesise as in traditional research but a solution with practical application (Hevner and Chatterjee, 2010).

### 9.3 Key Research Findings

Since the current study aims to develop a system solution, a design science research framework was deemed the best approach. Other methods, such as ethnographic approaches, are easily integrated into the design science framework, especially the Hevner et al. framework, as it applies different methods in separate cycles (see chapter 3). Furthermore, each cycle could be a complete piece of research by itself, with the outcome of one cycle feeding the other cycles. Accordingly, the research followed a systemic process development, and the researcher employed it systematically using the methods, guidelines, language, and terminology.

The study starts with a literature review (see chapter 2), called the environment, to understand several factors; this includes: What are the lessons learned from past research? How have other researchers contributed to the problem? What are the parameters that could impact the problem? What parameter has a direct impact on the solution? Et cetera.

After reviewing those parameters, the researcher identified these gaps to understand the problem better and understand people's opinions concerning the problem and solution from this aspect, called the Relevance Cycle. This point is essential to highlight bias, solution, when and where bias might happen and the impact that bias might have. In this study, the author used the crowd's wisdom to collect data from various relevant stakeholders (managers and job seekers), collecting data about their experiences and problems and how they think these problems could be solved. The researcher identified where bias and discrimination were created and most impactful.

The use of ethnographic methods (see chapter 4) allowed the researcher to identify 77 biases that affect employment selections; also understand each bias story and identify “How it happens”, “When it happens”, and “why it happens”, thus adding considerable knowledge to the domain about the scope and impact of employment selection bias on both managers and job seekers.

This work provides a substantial contribution since the researcher has explicitly catalogued the bias impact of employment selection; there are two similar idea studies, but for different domains, bias impacts the medical field and project implicit. However, for consideration of user experience, the location and the impact of bias in the employment selection process, see appendix C.

After completing the above two cycles in the research framework, the author entered the third cycle, “Develop and Justify”, intending to create an artefact that mitigates bias in the employment selection process. However, testing the proposed solution in a Relevance Cycle with the identified 77 biases collected in the ethnographic stories failed to create an artefact, suggesting that an additional iteration of the DSR framework was required before satisfaction could be achieved. The researcher was unable to achieve satisfaction in chapter 4 because of the high subjectivity in the domain; however, able to

capture feedback, expressed across chapters 4 and 5, highlighting points and approaches that create and minimise bias. The main problem points, that is, areas where the most biases were identified, are:

1. Knowledge and experience authenticity are documented in the CV.
2. The employer philosophy of hiring: i.e., hiring based on team dynamics, et cetera.
3. The hiring methods: A plethora of scholars agreed that interviews could be, if unmanaged, a biased process.
4. Technology: There are many bias-reducing technologies; however, they are still considered as a point of bias.
5. A job description that is designed/manipulated to match a specific person.
6. The CVs selection process used to shortlist potential candidates contains bias and subjectivity due to the interpretation.
7. The evaluation criteria are poorly defined or not defined at all.
8. Implicit measurement adds subjectivity and becomes a point of bias creation.
9. What is the truth, and how has it been measured? This is an axiological question due to the contradictory dilemma between managers and job seekers concerning the truth in selecting the best candidate.
10. What is an intelligent candidate? A question was raised in casual conversation by managers after the interview.

Although the first iteration satisfied research objectives 1 to 4, according to the DSR research framework, a second iteration is needed to develop the artefact.

The second 'Environment and Relevance Cycle' (see chapter 5) helped identify more precisely the most critical factors and measures concerning how decision-makers, the control component of the loop, act concerning the critical factors (in line with research objective 5). In the same chapter, the researcher collected three types of data, i.e., direct questionnaires, observation of behaviour, and examining 18 months of data reflecting how managers act in the industry (see chapter five). The findings showed that decision-makers often fail to recognise or understand issues related to knowledge, experience, and bias. The researcher identified that the subjective nature of the current selection process is a critical problem with the current selection process. Accordingly, the second knowledge base and Rigor cycle aimed to identify mechanisms to remove subjectivity from the second artefact and identified the most important parameters for removing subjectivity from the surrounding environment. The methods identified, and used to remove subjectivity, include complex loops, SECI knowledge management, and computational thinking – i.e., to support the decomposition and codification of knowledge, identified in chapter 6 as the kernel theories.

The ideas presented in chapter 6, within the context of an adapted employment lifecycle (Arthur, 2006), divided knowledge into "socialisation", "externalisation", "combination", and "internalisation" phases

for each of the five stages. For example, i) writing the job description, ii) advertising the job description, iii) considering the point system, iv) selecting the candidate, and v) declaring the chosen candidate. The discussion and presentation of processes in this section are of different value; however, they are best when the study integrates them into the final artefact solution.

The third stage in the second iteration was the "develop and justify" (see chapter 7 for full details). The findings of all previous stages (from both iterations one and two) were combined to produce the employment selection artefact (see figure 7. 2) – thus, satisfying research objective 6. The design employs the explicit and implicit knowledge developed through the research iterations to shape the final artefact as a prescriptive contribution to solving world problems, i.e., biases in the employment selection system. Although the selection artefact could be used as a stand-alone solution, it suffers since there is no mechanism to maintain relevance over time, suggesting that the artefact is prone to perishing due to environmental, organisational, and societal change.

Objective 8 highlighted a need to eliminate this perishable nature of design science. In the final artefact, this was achieved by wrapping the selection artefact with an additional open loop that monitors system relevance and re-activates the Hevner et al. DSR framework if the value of the artefact is perceived to have perished. Although this was developed in this research, specifically for use in the employment selection process, this finding significantly impacts design science research; as including an open loop in design science research adds considerable value, especially in a dynamic or changing environment. For example, the augmented version of DSR could be used to monitor the value of findings presented in research papers over time. If the contribution value of the research finding is perceived to have fallen below a defined level, then this can be flagged to the author and all readers. The author of the research and the reader might then choose to repeat and modify the research to update the relevance (where appropriate), thus renewing the relevance and contribution of findings.

Finally (in chapter 8), the researcher evaluated the artefact i) critically against the 77 biases and ii) to gain feedback from relevant scholars and domain experts.

In the critical assessment, the researcher identified that (see chapter 8):

- 1) Managers might be able to cheat the system if they first agree with their superiors or superiors to include imaginary requirements.
- 2) If the monitory bodies (for example, a small law firm) are connected to these managers, then the monitoring body could be influenced to overlook specific subjective or biased actions.
- 3) If the job advert did not obtain many job seekers, then there are only a limited number of people critically reviewing the advert and whistleblowing false information.

4) If a practitioner manipulates the system without considering all aspects, the influence may impact confounding variables, i.e. have a negative impact on other stakeholders and all information within the process.

5) If a job seeker takes on the role of a whistle-blower, then it is essential that they can effectively explain the technical bias and express clearly where this is employed in the job requirements and why they are raising the alarm.

The researcher considered all points and (in chapter 8) expounded on several issues that must be considered when implementing the final artefact employment selection process.

When considering scholar and domain expert feedback, most people agreed with a particular aspect of the solution, for example, the points-based system – see chapter 8; however, more than half of the individuals questioned agreed with all aspects of the final artefact system (see table 8.3). Most of the issues raised against the system, see table 8.1 and table 8.2, were subjective in nature, for example, managers wanting the option to hire whomever they think.

Although the final artefact support evolution, with a different set of requirements from the current system, the researcher argued that the current system is not fit for use and purpose; also, the desire to include subjectivity would result in a solution that is by nature more biased.

The researcher believes that the study has several contributions:

1. The final artefact (see chapter 7) is a prescriptive contribution to world knowledge. This is according to the design science research framework (Hevener, 2004).
2. The final list of seventy-seven biases (see chapter 4) impacts the employment selection system. Two published studies are similar, like biases impacting medical staff (doctors) and project implicit.
3. Discover the manager's misconception of the critical parameter in the hiring system, see (Chapters 4 and 5).
4. Identify the problematic stages in the employment selection system (see chapters 4 and 5).
5. Identify a way to remove subjectivity from knowledge, which is subjective in nature, by embracing the SECI knowledge codification process in the employment selection system (see chapter 6).
6. Introducing an open loop to improve Hevner et al.'s (2004) design science research framework (see Figure 7.3) by adding such a mechanism eliminating the artefact's perishing aspect.

The researcher is confident that the thesis has addressed all eight objectives, met the aims, and solved the problem. This was evaluated in chapter 8, and although a number of critical comments were raised, and these points should be considered in the implementation, the majority of points suggested a welcoming of, or an acceptance of, subjectivity and bias (i.e., the assumption that bias is ubiquitous and that removal of bias is not practically possible).

The researcher's view, and the view expressed in this thesis, is that although the bias is complex, it can be mitigated; and every effort should be taken to do so. The researcher accepts that bias is inherent in human nature due to the subjectivity of reality (Andersen et al., 2019), yet this is why the final artefact rejected specific inputs because of the symbiotic relationship between subjectivity and bias (correlation). The researcher believes that appreciation of the existence of bias is a reason why every effort should be taken to remove it from the employment selection system.

## 9.4 Difficulties Facing the Study

### 9.4.1 Research Issues and Barriers

The main difficulty in research is data collection, primarily in a sensitive subject; for example, the survey links have been sent to over 1000 people, as shown in Appendix H; however, only a few returned the survey with answers. People are different, and not everyone appreciates that diversification is healthy for the environment.

The design science method has a different approach; every individual could favour a specific approach according to the past knowledge residing in that individual's head. For example, if someone has background knowledge in a structure or framework, they most likely choose the design science method that could have a block diagram or structure matching what resides in that individual head. Unfortunately, this differentiation could develop an argument or discomfort when two individuals work on the same method.

The second barrier is also related to data; when the researcher inspected Job Centre data. The plan was to consolidate the initial finding with job centre hiring statistics, but the researcher changed direction a bit due to this difficulty. However, it was challenging to get the data parameter needed to fulfil the research requirement; therefore, the study had to collect the data manually and did not use the data from the Job Center.

### 9.4.2 The Pandemic

After one year of the PhD journey, the covid lockdown stopped face-to-face meetings, which limited communication with supervisors. Online meetings were available; however, there was often difficulty with voice clarity. In the annual review, the reviewer had to listen to the sentence and suggest the other part of the sentence. This happens because of voice clarity issues; this is the case in some meetings with clients and individuals for data collection. This is not just because of bandwidth but could be a processor, computer overheated, Bluetooth, et cetera.

The researchers also planned and demanded that known people be invited for further conversation. However, because of COVID, this socialisation process has been limited, and no one easily accepted home visits. Since the home visit was not available, and not enough budget was available, the researcher

had to depend on an interview with managers on voluntary bases, which limited the time and questions for further investigation of the problem.

COVID impacted this journey and people contributing to data collection, communication, et cetera. The plan when the PhD journey started was to use the church community for data collection where after COVID, only ¼ or less showing between time and time; this has an effect directly and indirectly.

### 9.4.3 Limitations of Research

The main limitation is data collection because the survey required time, and not everyone was willing to contribute to such a study voluntarily. Different websites are currently employed as collaboration sites where the researcher themselves contribute to each other studies; as suggested by Howitt and Cramer's guidelines (Howitt and Cramer, 2007), incentives could mitigate such issues; however, they might require funding in this way the process becomes more intelligent, especially in the first three years when the pandemic happened, people started to be afraid to interact with others and isolate themselves in a bubble.

The isolation reduced the number of people the researcher planned to interview, where the plan was a minimum of eight interviews; nevertheless, saturation was reached because the researcher reduced the parameter intended to research. Also, the bubbles impacted how the researcher interviewed them. The researcher had to search and read several articles until the discovery of the ethnographic interview approach. The researcher started to mimic and employ; this method; in fact, the researcher attended different qualitative research methodologies seminars and rarely found someone discussing ethnography, although it is a very feasible and viable method with many advantages. In fact, this was the only suitable method for such a study because it could discover hidden activity and biases.

The second limitation is the subject itself because the author noticed it is sensitive when discussing it with practitioners, and some unexplained and understanding psychology or politics push people away from the subject. This may be because people are afraid to talk about the topic and not fall into such a trap; the study did not have the time to investigate why, as it is out of scope. One of the main tangible pieces of evidence is Facebook, which blocked the survey for over a month and then reopened it, causing administrator issues.

The third limitation is that practitioners and decision-makers are eager for power, and the subject study aimed to remove this power from their hands. So, the study faced high resistance, especially from people who are beneficiaries of the current situation; again, it is similar to the Duck-Rabbit image by (Ludwig Wittgenstein Fuglesang, 1982), where the image is seen differently according to the direction. The subjective drives scholars to re-examine subjective views concerning utility because a third measurement should be in place when a case is subjective. This study removed subjectivity by finding the most critical factors.



The final limitation discussed in the evaluation section where the system is evaluated conceptually because the researcher has no ability to develop the system as a material and collect empirical data. The conceptual system approach is employed in many studies, as discussed in Chapter Two, and has the same value as an empirical one because you cannot have an empirical system without a conceptual system in every project.

To collect the empirical data, the researcher must agree on an approach to develop the system and then employ it in reality, which could also be difficult without conceptually testing it.

Developing an empirical system could require different technical expertise and components, and jumping to this step without conceptually examining the project could jeopardise the entire project, as discussed in Chapter 5. The project loses the management aspect of the system and the psychological component, which is the key factor to a social-technical materiality system. Finally, empirical evaluation of natural artefacts provides an explicit view of the system, which is a step required in the future. However, this is a complete project requiring a plan that could be implemented under the PRINCE2 framework and technical team. So it might be recommended that the author be involved in the project plan or draft the project plan in case this project is going to be materialized.

## 9.5 Further Research

This study identifies further research needed to keep the environment cleaner continuously; for example, the study identifies that CVs are an old practice and legacy process; therefore, the study suggested substituting the CV by platform. However, the platform should contain metadata that indicates other factors like updated CV time, CV authenticity, and continual monitoring; this could be linked to the employment institute as concrete evidence. The main problem is that the current platform benefits from the company, not the end-users. A study needs to measure if the end-users are happy to pay a minimum amount, like 5GBP per user a month, to maintain the CVs, highlighting CV authenticity guidelines. In this way, the CVs become authentic, and no manager can ignore a CV just because he feels the owner is lying; in this way, if someone lies in a CV, they are responsible if they flag it as authentic. Another study is needed to identify the authentic parameter and law consequences; an example is LinkedIn; with additional protocols, in such way, we are able to refute Polanyi's famous speech, "Human knows more than what can tell," but with such technology, we are able to articulate what we know in detail.

The cost of CV storage and CV authenticity is a recommended study for the future that is possible to integrate with this system. Also, if the company is willing to integrate local certification with the system and what costs are involved, especially since we are in the cloud era, integrating such a system becomes affordable.

The other point worth highlighting for a future study is the advantage and disadvantages of networking in decision-making toward knowledge. In contrast, biased could have a more substantial effect on networking than an individualistic decision-maker concerning knowledge.

Finally, subjectivity in knowledge limited further in-depth studying the subjective topic, as the author agreed there is subjectivity and stop at this point, where this study suggested employing design science and developing a framework that mitigates subjectivity when subjective arguments arose concerning knowledge.

## 9.6 The Research Summarization.

The research followed a systemic process developed by an eminent Scholar who developed this method, and the system employed it systematically using the methods guideline, language and terminology.

The study starts with a literature review where called the Environment to understand several factors; this includes, what are the lessons learned from past research, how other researchers contributed to the problem, what are the parameters that could impact the problem, what parameter has a direct impact on the solution and much more.

After reviewing those parameters, the researcher at this stage identifies gaps intending to understand the gap in more depth concerning the problem by employing a research method that is appropriate to the situation; this calls the Relevance Cycle. This point is essential to highlight that bias could happen at a specific time and impact other times.

In this study, the author uses the crowd's wisdom to collect data from people related to their experiences concerning the problem and how they suggested solving them. So, the study identifies several stages where bias and discrimination could develop and reflect. The study is a contribution because it understands particular discrimination cases in employment selection, how it happens when it happens and why it happens, so problematics stages are identified in this study.

At this level, according to the research framework, the author aims to isolate and identify the parameters that impact the design, which is the biases, therefore digging into the knowledge-based to identify a method suitable to understand biased in more depth as parameters impacted the design. Therefore, the ethnographic methods are justified to understand those parameters and identify 77 biases that affect employment selections. This is a contribution worth mentioning similar study called project implicit, which aims to identify bias and develop awareness, and another called Catalogue of Bias, which **studies biases that impact the medical field (catalogofbias.org)**.

After completing the above two cycles in the research framework, the author enters the third cycle, called "develop and Justify or Build and evaluate." This study seeks the path of "develop and justify" because the methods have already been evaluated. This cycle failed to develop an artefact which is, if done so, considered a prescriptive contribution to world knowledge; the failure was because of high subjectivity in the domain and other parameters mistreated in the first cycle like hiring based on equity or quality and so on as described before. Those parameters become an input to the second iteration as recommended by the framework.

According to the research framework, another literature review is needed and identifies all the other parameters that have been ignored in the first cycle; therefore, a second iteration is needed to develop the artefact.

So, from reviewing the literature, data collection and knowledge gained from those two research, the study identifies other factors, like:

- What is an intelligent candidate?
- What is the foremost important factor that could make a difference in the hiring process?
- What are the hiring philosophies?
- How much knowledge do managers who are the decision-maker have concerning those factors? According to the finding (the knowledge section)?
- Et cetera.

The second Environment and Relevance Cycle were developed as a chapter to identify the most critical factors and measure how decision-makers, the control component of the loop, an act concerning the important factors. The decision-maker ignores and fails to understand these factors; this finding is through three stages: direct questionnaires, observation of behaviour and examining 16-month data and how managers act according to this data. Nevertheless, the study still has a problem; this factor is also reflected in the design. It is subjective; therefore, the second cycle, the knowledge-base and Rigor cycle, aims to find a way to remove subjectivity from this subjective parameter.

The knowledge-based and Rigor cycle developed as a chapter aims to identify the most important parameter and discover a way to remove subjectivity from the surrounding environment.

The method used to remove subjectivity from knowledge in CV is called kernel theory, as the first cycle failed to identify a kernel theory, and design without kernel theory is weak design and scholarly debatable. In fact, the design has more than one theory that supports the kernel theory, like the complex loop, computational thinking to support the decomposition process and others, as described before. Furthermore, the study identifies the theory behind the design as explicit system control by beneficial for error spotting.

The third stage in the second iteration is "develop and justify", where the Relevant and rigour of the two iterations contributed to the design. The design employs the explicit and implicit knowledge developed through this journey to shape the final artefact as a prescriptive contribution to solving world problems, i.e. biases in the employment selection system. However, through this journey, a finding revealed itself to eliminate the perishable nature of design science by employing the complex loop where design science mainly depends on the closed-loop process.

However, through serendipity and unplanned, this finding significantly impacts design science research because including an open loop in design science research could consider a continuous improvement.

So, many design science papers become unusable due to the world evolving or technology evaluating; this means what was difficult in the past became easy today due to technology that could reflect on design science and modification of papers findings.

Finally, to remove scholarly debate regarding the artefact "develop and justify" or "build and evaluate", the author evaluated the artefact to examine the usability aspect of system development and how beneficial it could be in a natural environment. Then the author questioned if the modification to Hevner was feasible and acceptable, This question after two hours presentation where the system introduced and discussed employing Socratic dialogue to gauge acceptance. In chapter eight, and according to the power point provided in Appendix E, the researcher asks if the modification, according to the scholar's knowledge, could remove the perishable nature of design science as continued system improvement approaches. The outcome was that four personas agreed with the system, where three persons partially disagreed with the system in contrast to one moderate position agreeing with the idea but not sure.

## 9.7 Main Contribution as a list.

The study has several contributions; below is the list in detail.

1. The artefact is a prescriptive contribution to world knowledge. The artefact supports the UK government's idea of the community inclusion principle for equality and equity in the employment selection domain; thus, society's inclusion in the employment domain is fulfilled by employing this artefact, considering knowledge is the only important factor.
2. The list of seventy-seven biases impacts the employment selection system.
3. The problematic stages in the employment selection system and the vast ways of discrimination are impossible to control in the current system.
4. Discover the manager's understanding of the critical parameter in the hiring system.
5. Identify a way to remove subjectivity from the knowledge by embracing the knowledge codification process (Nonaka and Takeuchi methods) in the employment selection system.
6. Implementing a way to improve design science methodology for Hevner (2004).
6. The theoretical contribution: The embedded theory in design is called design theory.

## 9.8 Conclusion

This study completed and tested an artefact as a prescriptive contribution to world knowledge that mitigates bias in the employment selection that impacts knowledge, cost, human programming and much more. The artefact is considered a contribution according to the design science research framework (Hevner and Chatterjee, 2010).

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## Appendix A

### Survey Information Sheet and Questionnaire

This questionnaire required 10 minutes from your time.

Dear participant,

You are being asked to take part in a research study that aims to develop a conceptual system to eliminate management bias within the hiring process.

Your participation - In this study, you will be asked to complete the questionnaire listed below.

Data Storage - All data is stored electronically. Backup copies are made on a local hard drive and never shared with anyone outside the research team. Data is destroyed after five years as part of the international data protection act.

Right to withdraw - You can stop being a part of the research study at any time with no need for an explanation. You have the right to ask that any data you have supplied to that point be withdrawn or destroyed, you also have the right to omit or refuse to answer or respond to any question that is asked of you. You have the right to have your questions about the procedures answered, before, or after the experiment.

Risks - There are no foreseeable risks.

Cost, reimbursement and compensation - Your participation in this study is voluntary and no monetary compensation will be given for this particular study.

Confidentiality/anonymity - The data we collect does not contain any personal information and any records of this study (either hard copy or electronic) will be kept private. In any sort of report, we make public we will not include any information that will make it possible to identify you. Research records will be accessed only by the researchers.

For further information please contact the researcher.

1. I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. I agree to take part in the above study voluntary.
  - Yes
  - No
2. Your Nationality?
3. What is your ethnic background?
  - White
  - Black British
  - Afro-Caribbean

- Indian
  - Mixed / Multiple ethnic groups
  - Any other Mixed / Multiple ethnic background
4. Are you bilingual?
- Yes
  - No
5. Have you ever searched for a Job?
- Yes
  - No
6. Do you think education to a degree level is worth pursuing?
- Please explain your answer
7. What Kind of Job were you are looking for?
8. In the past three years, how many interviews have you attended?
9. In the past three years, how many jobs have you applied for?
10. What were those roles?
- Give us examples, please
11. What is Your level of education?
- You can tick more than one
- GCSE
  - A-Level (equivalent)
  - Associate degree - 2 years
  - Bachelor's Degree- 4 years
  - Master's degree-1-2 years
  - Doctoral degree
  - Professional Certification
  - Other
12. What is the level of education needed in the role?

Complete multiple rolls (if relevant).

Role	GCSE	A-Level (equivalent)	Associate degree - 2 years	Bachelor's Degree- 4 years	Master's degree-1-2 years	Doctoral degree	Professional Certification

13. Did you fail to get the role at your last interview?



- Yes
- No

14. From your perspective do you think you were fairly evaluated?

Talking about the last interview

- Yes
- No
- Maybe
- I don't know

15. Do you think they interviewers understand your CV and knowledge?

- Yes
- No
- Maybe
- I don't know

16. Do you think the employer understood your CV (i.e., your skills, knowledge, experience, education, and abilities) and/or your reason for applying for this role? Explain your answer.

17. Were you stressed at the interview, and what is your stress level (0-10)?

Talking about the last interview

0	1	2	3	4	5	6	7	8	9	10

18. Do you think the next interview you will be more stress or less stress? Give an estimate of how stressed you will be.

0	1	2	3	4	5	6	7	8	9	10

19. Describe your experience.

20. What was your feedback about the interview? Explain (100-500 words)

You can talk about any interview you can remember

21. Can you evaluate the fairness of the interview from your perspective

<b>Job</b>	<b>No Com- ment</b>	<b>Very unfair</b>	<b>Unfair</b>	<b>I don't know</b>	<b>Fair</b>	<b>Very Fair</b>

22. Do you suggest a way to improve the interview process? Please provide 100-500 words.
23. Would you accept a job that you are overqualified for? Please explain.
24. What would you think if you are rejected for an overqualified role?
25. In your opinion, what is the best method for evaluating the best candidate for a role? Describe your answer for each role.
26. Do you think overqualified is a genuine cause for rejection?  
Please explain
27. Who do you think should make the decision to hire you (or evaluated you) at the interview in order to avoid management bias?

This question because people suggested that some managers might become bias in the hiring process

	<b>Direct Man- ager</b>	<b>Chief Knowledge Management Officer</b>	<b>Department Manager</b>	<b>Department Director</b>	<b>Human Re- sources or a universal body</b>
<b>Click on the best choice</b>					

28. Would you like to add additional information based on your experience?  
Please feel free to add any other information related to the domain



## Appendix B

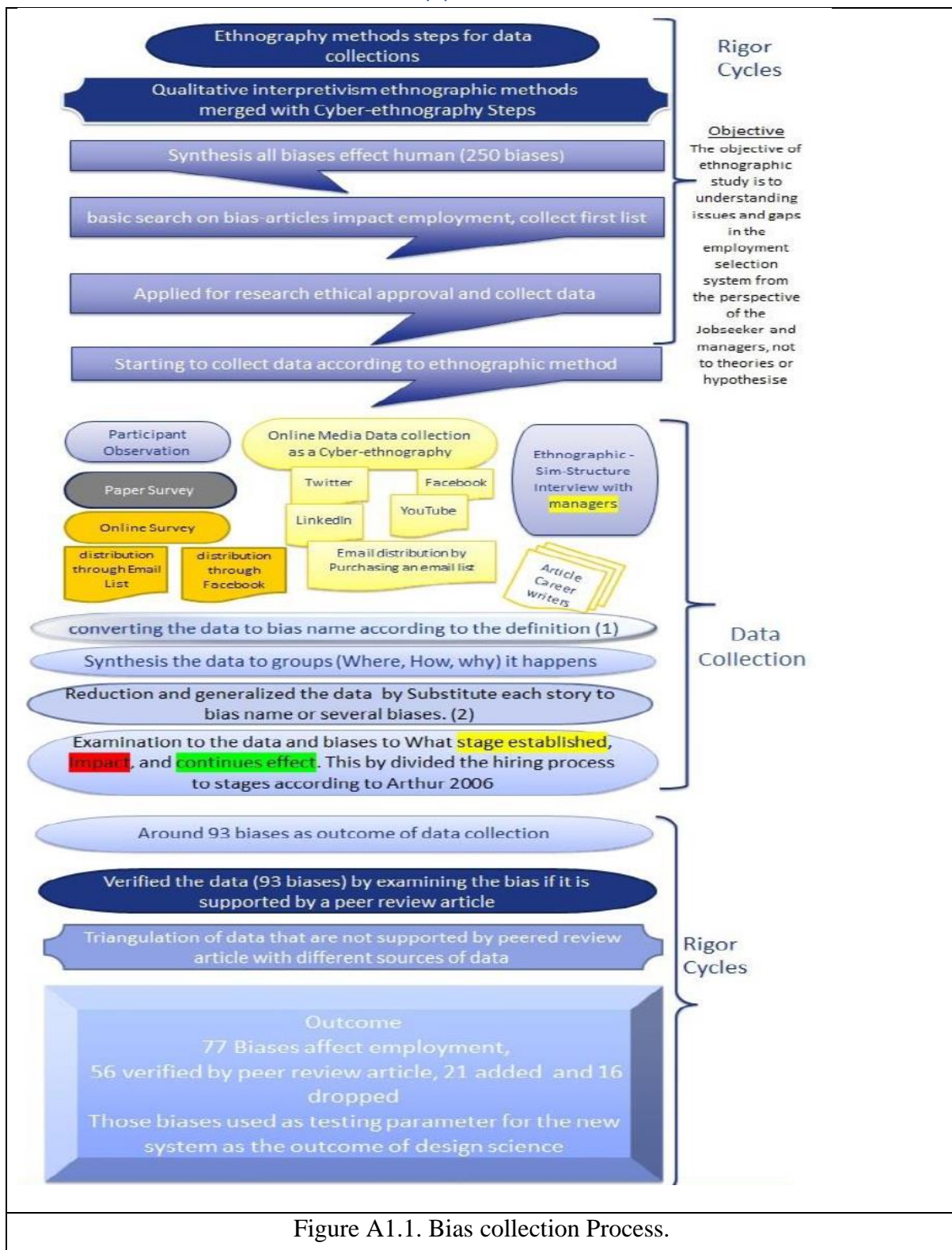


Figure A1.1. Bias collection Process.

## Appendix C

Full list of pre- and post-triangulation list of biases.

Initial biases before triangulation 93 (From subjective data collection)	58 biases identified in both peer-reviewed literature and subjective data collection	19 biases identified in both non-peer reviewed article and subjective data collection
Affect heuristics	Affect heuristics	Ambiguity effect
Affinity bias	Affinity bias	Anchoring or focalism
Ambiguity effect	Availability heuristic	Impact bias
Anchoring or focalism	baby face bias	Regressive bias
Anthropocentrism	Bandwagon effect	Selective perception
Attentional bias	Beauty bias	Semmelweis reflex
Authority bias	Belief bias	Singularity effect
Availability heuristic	Ben Franklin effect	Zero-sum bias
Baby phase bias	Bias blind spot	Authority bias
Bandwagon effect	body mass bias	Extrinsic incentives bias
Beauty bias	Choice overload	Group attribution error
Belief bias	Classism	Halo effect
Ben Franklin effect	Cognitive biases	Illusion of external agency
Blind spot bias	Cognitive dissonance	Shared information bias
Body mass bias	Confirmation bias	Context effect
Choice overload	Conflicts of interest	Cryptomnesia
Classism	Conformity bias	Google effect
Cognitive biases	Courtesy bias	Humour effect
Cognitive dissonance	Cross-race effect	Tip of the tongue phenomenon
Conflicts of interest	decision fatigue	
Conformity Bias	Distinction bias	
Context effect	Diversification Bias	
Contrasting-Contraction bias-framing type	Dunning–Kruger effect	
Contract effect-Contrast Bias-memory type	Ego Depletion	
Courtesy bias	Endowment effect	
Cross-race effect	Expectation anchor	

Cryptomnesia	Failure to Estimate
Cultural Bias	False consensus effect
Decision fatigue	Favouritism
Distinction bias	Financial biases
Diversification Bias	Framing
Dunning–Kruger effect	Groupthink
Ego Depletion	Horn effect
Egocentric bias	Illusion of transparency
Endowment effect	Intuition
Expectation anchor	Lookism
Extrinsic incentives bias	Optimism bias
Failure to Estimate	Outgroup homogeneity bias
False consensus effect	Overconfidence bias
Favouritism	Prejudices
Financial biases	Priming
First impressions	Pygmalion effect
Framing	Racism
Gender	Reactive devaluation
Google effect	Reciprocity
Group attribution error	Regulatory issues
Groupthink	Reporting bias & social desirability bias
Halo Effect	Selection bias
Horn Effect	Self-serving bias
Humour effect	Sexism
Illusion of external agency	Similarity attraction bias
Illusion of transparency	Social desirability bias
Illusory correlation	Spotlight effect
Impact bias	Stereotypical bias
Inconsistency in questioning	The next-in-line effect
Intuition	Third-person effect
Leniency Effect	Ultimate attribution error
Lookism	Women are wonderful effect
Negative emphasis	
Nonverbal bias	
Optimism bias	

Outgroup homogeneity bias  
Overconfidence bias  
Overweight bias  
Personal Similarity Bias  
Prejudices  
Priming  
Pygmalion effect  
Racism  
Reactive devaluation  
Reciprocity  
Regressive bias  
Regulatory issues  
Reporting bias  
Selection bias  
Selective perception  
Self-serving bias  
Simmelweis reflex  
Sexism  
Shared information bias  
Similarity attraction bias  
Singularity effect  
Social comparison bias  
Social desirability bias  
Spotlight effect  
Stereotyping bias  
The illusion of external agency  
The next-in-line effect  
Third-person effect  
Tip of the tongue phenomenon  
Ultimate attribution error  
Women are wonderful effect  
Zero-sum bias

## Appendix D.

### Impacting Biases

A number of issues are considered out of the domain (OOD)

Within the ‘selection of the candidate’ stage, the recruiter must: A) make automated or manual decisions/checks based on the candidate’s CV; B) clarify information about the job role (if role/skills mapping is unclear); C) define information about the interview/selection process; and D) email applicants with a full interview and job details. Within the ‘interview/selection process’ stage, a number of steps concerning the interview process and format are normally considered, including A) Meeting the candidate at the reception; B) providing an introduction at the interview; C) providing background to the reason creation of the role; D) make any legal and education checks; E) discuss personal strengths; F) discuss personal weaknesses; G) received a question from the candidate; H) rap up the interview; I) determines the outcome of the decision, and J) highlights a continuous effect.



## D1 - Job Seeker's Perspective

### Peer-reviewed Literature and Subjective Data Collection

Bias list	O O D	Selection of the Candidate				Interview / Selection Process									
		A	B	C	D	A	B	C	D	E	F	G	H	I	J
Ambiguity effect															
Anchoring or focalism															
Availability heuristic															
Belief bias															
Bias blind spot															
Confirmation bias															
Courtesy bias															
Distinction bias															
Dunning–Kruger effect															
Endowment effect															
Impact bias															
Optimism bias															
Overconfidence effect															
Pygmalion effect															
Reactive devaluation															
Regressive bias															
Selection bias															
Selective perception															
Semmelweis reflex															
Singularity effect															
Social comparison bias															
Social desirability bias															
Stereotyping															
Third-person effect															
Women are wonderful effect															
Zero-sum bias															
Authority bias															



## D2 – Job Seeker’s Perspective

### Non-peer reviewed article and subjective data collection

Bias list	O														
	O	A	B	C	D	A	B	C	D	E	F	G	H	I	J
	D	Selection of the Candidate				Interview / Selection Process									
Affect heuristics															
Affinity bias															
Beauty bias															
Ben Franklin effect															
Classism															
Cognitive biases															
Conflicts of interest															
Conformity bias															
Expectation anchor															
Favouritism															
Framing															
Groupthink															
Horn effect															
Overconfidence bias															
Racism															
Regulatory issues															
Reporting bias															
Sexism															
Similarity attraction bias															
social desirability bias															

## D3 - Manager Perspective

### Peer-reviewed Literature and Subjective Data Collection

Bias list	O O D	Selection of the Candidate				Interview / Selection Process									
		A	B	C	D	A	B	C	D	E	F	G	H	I	J
Ambiguity effect															
Anchoring or focalism															
Availability heuristic															
Belief bias															
Bias blind spot															
Confirmation bias															
Courtesy bias															
Distinction bias															
Dunning–Kruger effect															
Endowment effect															
Impact bias															
Optimism bias															
Overconfidence effect															
Pygmalion effect															
Reactive devaluation															
Regressive bias															
Selection bias															
Selective perception															
Semmelweis reflex															
Singularity effect															
Social comparison bias															
Social desirability bias															
Stereotyping															
Third-person effect															
Women are wonderful effect															
Zero-sum bias															
Authority bias															



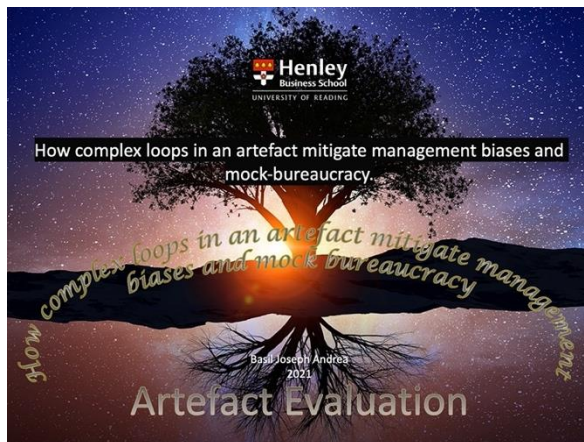
## D4. Manager Perspective

Non-peer reviewed article and subjective data collection

Bias list	O														
	O	A	B	C	D	A	B	C	D	E	F	G	H	I	J
	D	Selection of the Candidate				Interview / Selection Process									
Affect heuristics															
Affinity bias															
Beauty bias															
Ben Franklin effect															
Classism															
Cognitive biases															
Conflicts of interest															
Conformity bias															
Expectation anchor															
Favouritism															
Framing															
Groupthink															
Horn effect															
Overconfidence bias															
Racism															
Regulatory issues															
Reporting bias															
Sexism															
Similarity attraction bias															
Social desirability bias															

# Appendix E

## Evaluation Presentation Slides



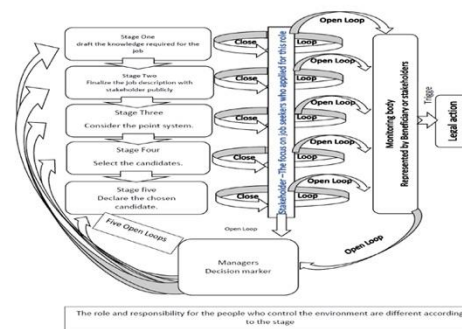
### Introductions

1. This study developed an artefact, which is a system to **mitigate biases in the employment selection domain** after two cycles of design science research.
2. Each cycle contain two investigation one in relevant cycle and rigor cycle.
3. The system is **vendor-neutral** which is not based on a particular technology.
4. This presentation aims to explain the artefact and collect your valuable opinion as scholars and expert practitioners in the domain.
5. The system develop for large company with public shareholder not SME. So, the system only for company who understand the impact of Bias on employment.
6. The system has three vertical columns and five horizontal columns; all are connected. Each section in those columns builds based on theory collected from an adjacent domain or to overcome issues discovered through data collection.

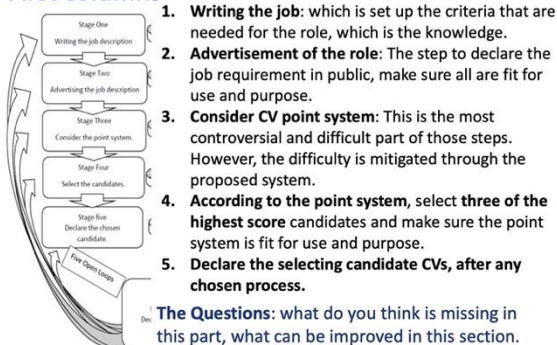
### Examples of some of the studies that were conducted

1. Survey employing wisdom of the crowd method collected data regards employment domain.
2. Study employs several ethnographic methods and observation reveal that there are 77 biases impact employment hiring process.
3. Inductive study employ several observation methods and the finding reveal that mid managers in top down structure organisation unable to articulate the different between knowledge and experiences, in addition managers employ shortcut using their own judgment instead of employing knowledge and calculation, which is biased.
4. Managers unable to assess the vitality of knowledge they do not have which impacting the selection process.
5. Managers are unaware of new knowledge that has vital impact on organisation.
6. Theoretically, the employee is an organisation assets that could impact company share value if biases inflated in the organization.

### Quick view to the artefacts



### First columns



### The point system

1. There is no point system that serves as a **panacea to all roles**; however, knowledge codification mitigates the difficulty by employing the SECI by Nonaka and Takeuchi, concerning the study's slight modification of subjective or objective knowledge in comparison to the role. The SECI stands for socialisation, externalisation, combination, and internalisation.
2. The SECI work as CV **standardization** to express knowledge.
3. There are separate point systems for each part.
4. The system aims to convert candidate tacit knowledge into explicit.
5. The point system has double **redundancy** as it is the nature of the SECI. (Tacit to explicit and from explicit to tacit) so the redundancy work as an assurance mechanism.
6. Each section in horizontal columns one considers the four categories of knowledge that are derivative from the SECI system.



## Knowledge categorisation

### Socialisation (Tacit to Tacit)

- First **agrees** on tacit knowledge; this includes but is not limited to social skill, Company culture, etc.
- The main point is to **reveal what the candidate knows** and verify the objective knowledge through a process. Also, setup a universal ground by agreeing on social skill and other intangible elements
- This is **unmeasurable knowledge** required for the role and could be subjective, and It has no clear knowledge database and is yet to be converted to explicit. For example, reading a fiction book create tacit knowledge that has little value. In contrast, reading peer-reviewed book has a different value and should not be under this section, especially if the knowledge from this book is objective to the environment. However, if the peer-reviewed book contains subjective knowledge of the environment or the job, it should be in this stage.
- For example, **knowledge in software that has no measurable component**.

The idea is to reveal knowledge obtain by this person in general; if the knowledge has value to the role, **verification should be arranged**.

## Knowledge categorisation

### Externalisation (Tacit to explicit)

- This section harvests the **tacit information gained from an explicit source**, and the source value is not perfectly verified. So that this knowledge fit for use and purpose to the environment, which is the source of the knowledge, is explicit; however, the value of this knowledge could be **subjective**.
- The **crucial point is knowledge position**; if it is objective or subjective with the environment in case it is subjective, it will fit under this section.
- The knowledge gains from **explicit sources that have a subjective component**, like books, that demonstrate an opinion and are not tested. However, it remains tacit in the candidate mind.
- The **candidate experienced** that demonstrate the owner view and knowledge; it will fit in this section.
- Non-credited certification** fit under this section like the **company provides experience certification with no clear program**

## Knowledge categorisation

### Combination (Explicit to explicit)

- This section aims to harvest the candidate knowledge from explicit sources and verified sources; also, the recipient knowledge is verified as well after knowledge transfer. For example, **PRINCE2 certification**, the **reason this knowledge** harvested years of experience and developed to a trademark framework. So, it is practical knowledge converted to explicit. This kind of knowledge is explicit, and the recipient holds the knowledge as explicit in an open-book format. So, any industrial certification fit under this section as it is explicit. However, this does not include academic degrees like BSc or MSc. An education program has an implicit meaning embedded in the recipient's mind; such knowledge fits under internalisation with is explicit to tacit.

## Knowledge categorisation

### Internalization (Explicit to tacit)

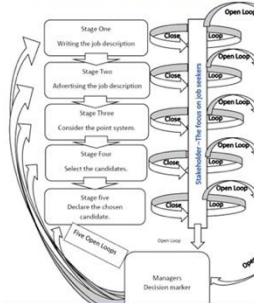
- This is explicit to tacit, which means knowledge gain is absolutely true, tested and verified sources, and the candidate learns it and converts it to explicit, so it is possible to share it
- This kind of knowledge lies under **a degree education** program because a degree education program teaches people explicit knowledge, includes practical and theoretical, and is converted to implicit because the education program has embedded meaning.

## The idea behind the point system

- The current study spotted **several wrong practices** that totally contradict the literature of knowledge and experience, ignoring biases.
- Recruiter and companies **looking for years of experience** more than knowledge, where the literature highlighted that knowledge is a higher order than experience, **experience subjected to biases** and measure by how many tasks not the number of years.
- The **points system** is a way to overcome the difficulty of comparing many candidates. This process developed conscious and unconscious biases in the decision-maker-minds, like, confirmation bias, verbatim effect, Availability bias and much more biases related to memory, statistic and others as systematic errors in thinking.

**The Question: what do you think regarding employing a point system in measuring candidates.**

## Second columns

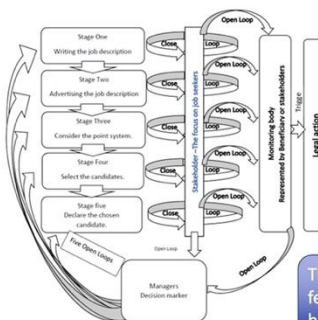


- The second columns demonstrate the stakeholder; however, the **key point is job seekers who applied for the role**.
- Job seekers serve more than one role.
  - First, monitor the stages, and become a **whistleblower** when bias happens.
  - Second, **exchange information** and enlighten the first columns with knowledge.

For example, in stage one, writing the job, no recruiter or managers know it all, so exchanging the information with the job seeker drives the job description to perfection. Also, if someone claims that they did Pascal programming in Quantum Computing, the recruiter might not know pascal will not work in a quantum computer; however other individuals falsify this because this person is a competitor, so the second person is the beneficiary.

**The Question: What is your feedback on the second column?**

## Third Columns



- The third column represents stakeholders in general and legal firms interested in observing the process for its own benefit to spot illegal cases and take further action.
- Many firms are interested in what call "no win no fee" cases if they have evidence, so the explicit system help with the law evidence.
- The monetary body because the ethnographic study shows that the law process failed and cannot collect evidence due to the current implicit system.

**The Question: What is your feedback regards two monetary body and law firms?**

## The horizontal columns

- Stage one : close loop help in fixing error in job description, exchange information, drive the job description and requirement to perfection.
- Stage Two: declares the requirement and exchange information with the close loop regarding the final requirement.
- Stage three: Assigned the point system according to SECI, the close loop to verify if the requirement and the point system has no biases.
- Stage four: Select the 3 top candidate according to the point system explicitly and the close loop verify the selection is bias free as much as possible.
- Stage Five: Any methods of evaluation if interview or any chosen approach to examine the process is fit for use and purpose; the main point is explicit and declared explicitly. The close loop also examine if the process if bias free as much as possible. If no legitimate objection candidates is hired.
- If disagreement arises the third column involvement where issue escalated or the management monetary body as alternative solution.



#### Pre-Step One

- List the job in job site by providing the job link
- List the knows requirement in the page link for the job in the discussion form
- Example: Job Name Business Analysis click on [www.JOB1.net](http://www.JOB1.net)
- Inside the links List the Socialisation requirements
- Inside the links List the Externalisation requirements
- Inside the links List the Internalisation requirements
- Inside the links List the Combination requirements

#### Outcome

List of the requirement as the recruiter or managers thinking is write, as first draft.

#### Step One

- Exchange information with job seekers according to
- Socialisation-Externalisation -Internalization –Combination
- The recruiter or managers exchange information what is the best knowledge required for this role according to the above.

#### Outcome

Exchange information and amendment the job requirement according to the knowledge obtain from the crowd,  
As value added to the job description.

For example: someone could have read a book that is explicit and has objective value to the environment, This book used in several corporation and fetch success, highlighting this could help consider such knowledge

#### Step Two

- Finalized the requirement and make final.
- Check if there is objection
- Move to the second stage

#### Step Two outcome

Clear requirement for the job considering what other knowledge in the market.  
The requirements will be listed according to SECI

#### Step Three

- Create the point system according to
- Socialisation knowledge required which is check list
- Externalisation knowledge required 100% points
- Internalisation knowledge required 100% point
- Combination knowledge required 100% point
- Check if there is objection
- Collect CV and give them points this could be done by software.
- The CV should adapted the same SECI styles
- Check if anyone has objection regards CV Scoring.

#### Outcome for Step Three

- Point system assigned to the role according to SECI
- No one highlighted a bias in the point system.
- The job requirement become finalized and start select CVs using software or any other methods

#### Step Four

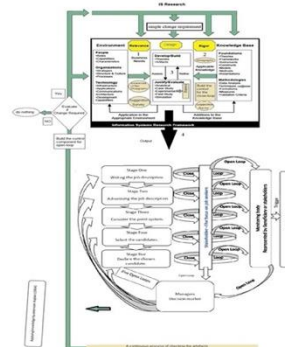
- Select the highest scores CV and verify them using any methods like interview,
- The process is explicit
- Check if anyone has objection to the chosen ones and if the objection is legitimate objection.

#### outcome Step Four

- Preliminary selection to the chosen candidate.
- Declare it in public with respect to id anonymisation.
- Make sure no one spot biases in the process.
- Agree on reject the spotted biased if any.

#### Step Five

- Declare the final decision with respect to ID anonymisation and privacy.
- Check if anyone has legitimate objection.



Finally,  
suppose this artefact is not working perfectly due to a change in the law or other reasons. In that case, we have an open-loop to trigger modification to the proposed artefact employing design science.

I am open to in-depth criticism of this approach and learning the other view.

Thanks for your time and support

## Appendix F

Johannes Haushofer: professor at Princeton University.	<a href="https://livereadingac-my.sharepoint.com/:b:/g/personal/he834485_student_reading_ac_uk/ETIqDNw4bnhKk-bZn5B-EfEBh0dAltNl7pJ95GO-eXO4u2A?e=maQbcO">https://livereadingac-my.sharepoint.com/:b:/g/personal/he834485_student_reading_ac_uk/ETIqDNw4bnhKk-bZn5B-EfEBh0dAltNl7pJ95GO-eXO4u2A?e=maQbcO</a>
	<a href="https://www.theguardian.com/education/2016/apr/30/cv-of-failures-princeton-professor-publishes-resume-of-his-career-lows">https://www.theguardian.com/education/2016/apr/30/cv-of-failures-princeton-professor-publishes-resume-of-his-career-lows</a>
Ivy League: Food Scientist	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/2-Cornell%20professor%20Brian%20Wan-sink%20re-signs,%20the%20school%20says%20-%20The%20Washing-ton%20Post.pdf?csf=1&amp;web=1&amp;e=DvzANp">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/2-Cornell%20professor%20Brian%20Wan-sink%20re-signs,%20the%20school%20says%20-%20The%20Washing-ton%20Post.pdf?csf=1&amp;web=1&amp;e=DvzANp</a>
	<a href="https://www.washingtonpost.com/health/2018/09/20/this-ivy-league-food-scientist-was-media-darling-now-his-studies-are-being-retracted/">https://www.washingtonpost.com/health/2018/09/20/this-ivy-league-food-scientist-was-media-darling-now-his-studies-are-being-retracted/</a>
Chanelle Poku: Pretended she had a master's degree	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/3-Croydon%20Jail%20for%20woman%20who%20landed%20senior%20NHS%20post%20with%20bogus%20CV%20-%20Evening%20Standard.pdf?csf=1&amp;web=1&amp;e=G6HLOP">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/3-Croydon%20Jail%20for%20woman%20who%20landed%20senior%20NHS%20post%20with%20bogus%20CV%20-%20Evening%20Standard.pdf?csf=1&amp;web=1&amp;e=G6HLOP</a>
	<a href="https://www.standard.co.uk/news/crime/nhs-job-cheat-chanelle-poku-croydon-crown-court-b970225.html">https://www.standard.co.uk/news/crime/nhs-job-cheat-chanelle-poku-croydon-crown-court-b970225.html</a>
Marilee Jones, the dean of admissions at the Massachusetts Institute of Technology	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/4-Dean%20at%20M.I.T.%20Re-signs,%20Ending%20a%2028-Year%20Lie%20-">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/4-Dean%20at%20M.I.T.%20Re-signs,%20Ending%20a%2028-Year%20Lie%20-</a>

	<a href="#">%20The%20New%20York%20Times.pdf?csf=1&amp;web=1&amp;e=7FVHfk</a>
Lis Riccobene: Director of medical examiners appears to have fabricated credentials	<a href="https://www.bostonglobe.com/metro/2018/05/30/director-medical-examiner-office-appears-have-fabricated-credentials/lxP6swhaBC15GYKhLwTWyN/story.html?s_campaign=bdc:article:stub">https://www.bostonglobe.com/metro/2018/05/30/director-medical-examiner-office-appears-have-fabricated-credentials/lxP6swhaBC15GYKhLwTWyN/story.html?s_campaign=bdc:article:stub</a>
	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/5-Director%20in%20medical%20examiner%E2%80%99s%20office%20appears%20to%20have%20fabricated%20credentials%20-%20The%20Boston%20Globe.pdf?csf=1&amp;web=1&amp;e=j0IXw0">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/5-Director%20in%20medical%20examiner%E2%80%99s%20office%20appears%20to%20have%20fabricated%20credentials%20-%20The%20Boston%20Globe.pdf?csf=1&amp;web=1&amp;e=j0IXw0</a>
MK: The doctor faked his CV to work at Northampton medical centre for seven years	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/6-Falsifying%20information%20on%20a%20CV-The%20consequences%20_%20myfirstcv.com%20Interview%20winning%20CV%27s.pdf?csf=1&amp;web=1&amp;e=CYv60Z">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/6-Falsifying%20information%20on%20a%20CV-The%20consequences%20_%20myfirstcv.com%20Interview%20winning%20CV%27s.pdf?csf=1&amp;web=1&amp;e=CYv60Z</a>
	<a href="http://www.myfirstcv.com/?p=322">http://www.myfirstcv.com/?p=322</a>
The CEO of Yahoo	<a href="https://www.cracked.com/blog/the-6-most-effective-ways-to-lie-your-resume">https://www.cracked.com/blog/the-6-most-effective-ways-to-lie-your-resume</a>
J. Bruce Harreld, the incoming president	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/7-Iowa%20Faculty%20Group%20Censures%20Incoming%20President.pdf?csf=1&amp;web=1&amp;e=8ze8Xz">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/7-Iowa%20Faculty%20Group%20Censures%20Incoming%20President.pdf?csf=1&amp;web=1&amp;e=8ze8Xz</a>

Jon Andrewes: former builder secured jobs as the head of two NHS trusts	<a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/8-NHS%20boss%20built%20career%20on%20fake%20CV%20_%20News%20_%20The%20Times.pdf?csf=1&amp;web=1&amp;e=AhMZTS">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/8-NHS%20boss%20built%20career%20on%20fake%20CV%20_%20News%20_%20The%20Times.pdf?csf=1&amp;web=1&amp;e=AhMZTS</a> <a href="https://www.thetimes.co.uk/article/nhs-boss-built-career-on-fake-cv-n8rx868tr">https://www.thetimes.co.uk/article/nhs-boss-built-career-on-fake-cv-n8rx868tr</a>
Dr Hakeem Lateef:	<a href="https://www.manchesterevening-news.co.uk/news/greater-manchester-news/nhs-doctor-struck-after-27-23089227">https://www.manchesterevening-news.co.uk/news/greater-manchester-news/nhs-doctor-struck-after-27-23089227</a> <a href="#">10-NHS doctor struck off after 27 years for faking his CV in bid to get new job in finance - Manchester Evening News.pdf</a>
Peter Knight, 53, served as chief information and digital officer at Oxford University Hospitals NHS	<a href="https://www.personneltoday.com/hr/nhs-boss-lied-about-degree-peter-knight/">https://www.personneltoday.com/hr/nhs-boss-lied-about-degree-peter-knight/</a> <a href="https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/9-NHS%20boss%20who%20lied%20about%20degree%20receives%20prison%20sentence%20-%20Personnel%20Today.pdf?csf=1&amp;web=1&amp;e=7chn4T">https://livereadingac-my.sharepoint.com/:b:/r/personal/he834485_student_reading_ac_uk/Documents/9-Fake%20CV-Example-in%20thesis/9-NHS%20boss%20who%20lied%20about%20degree%20receives%20prison%20sentence%20-%20Personnel%20Today.pdf?csf=1&amp;web=1&amp;e=7chn4T</a>
17 Executives who have lied on their CV	<a href="#">12-Successful Executives Who Have Lied on Their Resumes.pdf</a>
The 6 Most Effective Ways to Lie on your resume with a real example	<a href="#">13-The 6 Most Effective Ways to Lie on Your Resume _Cracked.com.pdf</a> <a href="https://www.cracked.com/blog/the-6-most-effective-ways-to-lie-your-resume">https://www.cracked.com/blog/the-6-most-effective-ways-to-lie-your-resume</a>

## Appendix G

### Example of errors in Jobs

*Table 6.1 Job description example - essential and preferred technical skills/knowledge*

**Essential:** Able to design, deploy, implement, and manage; Microsoft Teams; Microsoft Phone System / Business Voice / direct routing Microsoft Office 365 suite: Exchange online, SharePoint, OneDrive/ Active Directory

**Experience in:** Windows Server 2016 / 2019; PowerShell; File, Print, IIS and general server technology experience; Azure AD Sync and ADFS authentications methods including MFA; DNS - external and internal

**Preferred:** MCSA, MCSE or other relevant MS Certifications; Intune experience; Knowledge of the Azure Platform; Understanding of networking concepts: VLANs, QoS, Spanning tree, trunking; Experience in working with Gamma Solutions; **Experience of Microsoft Dynamics; ITIL or Prince2 qualification**

#### Information Technology Project Manager

Mazars ★★★★★ 391 reviews · Home Based  
Remote

[Apply on company site](#)

[Save this job](#)

##### Job Purpose

Mazars is a global, integrated and independent organisation, specialising in audit, advisory, accounting and tax services. We are among the top 10 accountancy firms within the UK.

The Business Technology team within Mazars supports the implementation and support of Information technology for the firm and within that, the Business Technology Change team deals with the change roadmap, project delivery and the adoption of technology change across the firm. This includes Business and pipeline management, Project Delivery, including appropriate project governance deliverables and that the stage gates for progression are in place to successfully and professionally manage project delivery as well as Change management and communication to ensure that change that is implemented as part of project management is well executed to remove barriers to adoption.

The role of Project manager is responsible for managing and delivering key projects or programmes as allocated in the strategic project portfolio. Mazars is defining and delivering several new initiatives that will contribute to its overall strategy and this requires who has the experience and passion to motivate teams and deliver specific project objectives.

While typically in the areas of technology and digital solutions, projects can vary from foundational IT projects such as:

- Network and infrastructure change,
- Cloud migration,
- Communication and collaboration projects
- Applications and business solutions,
- Delivery and adoption of new business services,
- Using technology to drive improvements in efficiency or new digital services

A broad range of experience in delivery of technology projects is required.

The Project Manager needs to be confident dealing with a wide variety of stakeholders and needs to be capable to adapt their style to each situation in order to reach the desired outcome. Experience of facilitating workshops and meetings is a pre-requisite for this role. The post-holder will have the personal and professional credibility and experience to build and manage meaningful and supportive relationships across the firm in order to deliver successful projects.

Project governance is critical for success, and experience in project and programme methodologies, with both theoretical and practical experience in working with these. The candidates should have demonstrable experience of delivering high quality project documentation including PIDs, plans, RAID logs and reports.

This role reports into the Head of technology Change within the Business Technology Services function of Mazars.

##### Benefits

Annual Leave +  
Charitable Giving  
Dental Insurance  
Wellbeing Benefits  
Virtual GP  
Cycle to Work  
Gym Discounts  
Life Assurance  
Pension  
Flexible Benefits +

##### Meet the recruiter

Show phone number

30

Information Technology Manager jobs in Home Based

Jobs at Mazars in Home Based

Information Technology Manager salaries in Home Based

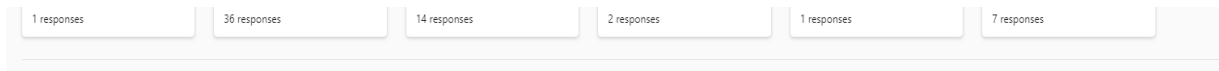
This Bold phrase has no value to the project manager role. A service portfolio includes a service pipeline developed in service strategy. So the project manager only follows what is required.

Each phrase required totally different experiences. For example, the network requires CCNP or CCNA as technical, depending on the network's size. For the project manager to understand how and what is needed to create a project plan, the technical team could help, so this information has no real value.

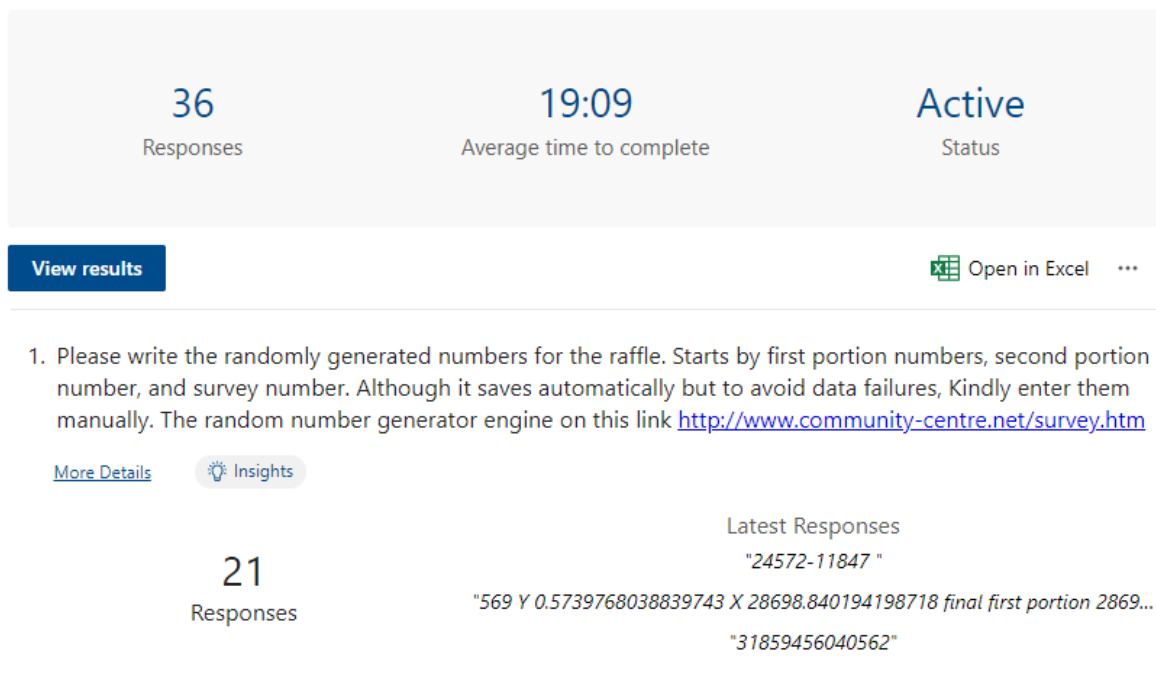
## Appendix H

The appendix shows one of the online Form outcomes and demography data and the sample of paid advertisement to distribute the link and the problem with Facebook when Facebook block the link; causing admin issue, and end up we have multiple links from Microsoft Forms

<http://www.community-centre.net/survey.htm>



### Survey questionnaires, employment issues. first artifact- public-version





1 respondents (5%) answered 2878729898 for this question.

31859456040562

2878729898

portion28699

Second Portion31150

2. ==INFORMATION SHEET== Dear participant, You are being asked to take part in a research study that aims to develop a conceptual system to eliminates managment biases and mock-bureaucracy through the hiring process. examining the open and closed-loop monitoring system, consequently employing design science and ethnographic study as methods to develop the system. your experience in the job market will help the researcher developed the first artefact considering your feedback and data. ==Your participation== In this study, you will be asked to complete the questionnaire listed below. ==Data Storage== All data is stored electronically. Backup copies are made on a local hard drive and never shared with anyone outside the research team. Data is destroyed after five years as part of the International data protection act. ==Right to withdraw== You can stop being a part of the research study at any time with no need for an explanation. You have the right to ask that any data you have supplied to that point be withdrawn or destroyed, you also have the right to omit or refuse to answer or respond to any question that is asked of you. You have the right to have your questions about the procedures answered, before, or after the experiment. ==Risks== There are no foreseeable risks. ==Cost, reimbursement and compensation== Your participation in this study is voluntary and no monetary compensation will be given for this particular study. ==Confidentiality/anonymity== The data we collect does not contain any personal information and any records of this study (either hard copy or electronic) will be kept private. In any sort of report, we make public we will not include any information that will make it possible to identify you. Research records will be accessed only by the researchers. ==For further information== Contact the researcher

3. I confirm that I have read and understood the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. I agree to take part in the above study voluntary.

[More Details](#)

[Insights](#)



4. Your Nationality?

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses

"THAI"

"Greek"

"Nigerian"

4. Your Nationality?

[More Details](#) [Insights](#)

36  
Responses

Latest Responses  
"THAI"  
"Greek"  
"Nigerian"

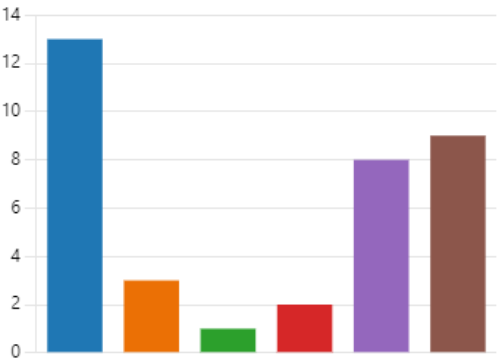
26 respondents (72%) answered **British** for this question.



5. What is your ethnic background?

[More Details](#) [Insights](#)

White	13
Black British	3
Afro-Caribbean	1
Indian	2
Mixed / Multiple ethnic groups	8
Any other Mixed / Multiple ethn...	9





## 6. Are you bilingual?

[More Details](#)

[Insights](#)

Yes	26
No	10



## 7. Have you ever searched for a Job?

[More Details](#)

[Insights](#)

Yes	34
No	1
Maybe	0



## 8. Do you think education to a degree level is worth pursuing

[More Details](#)

[Insights](#)

35  
Responses

Latest Responses

"It's depend on graduate career. "

"Yes"

"Yes. Education teaches theoretical foundations of professions, it also helps w...

## 8. Do you think education to a degree level is worth pursuing

[More Details](#)

[Insights](#)

35  
Responses

Latest Responses

"It's depend on graduate career. "

"Yes"

"Yes. Education teaches theoretical foundations of professions, it also helps w...

5 respondents (14%) answered **education** for this question.



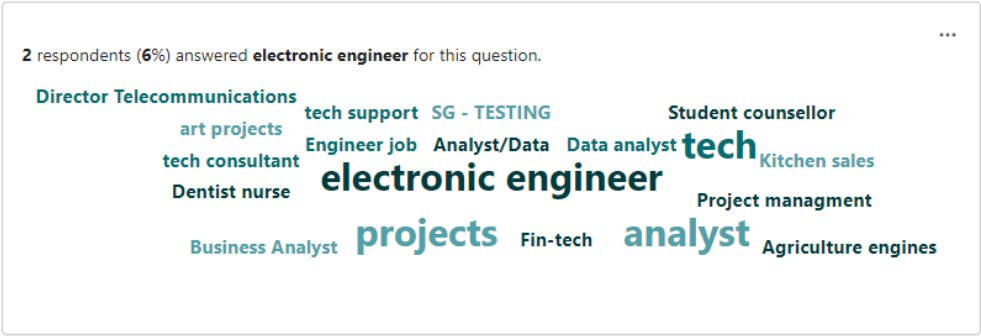
9. What Kind of Job you are looking for

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses  
"Fin-tech consultant "  
"IT related e.g. CIO"  
"management"



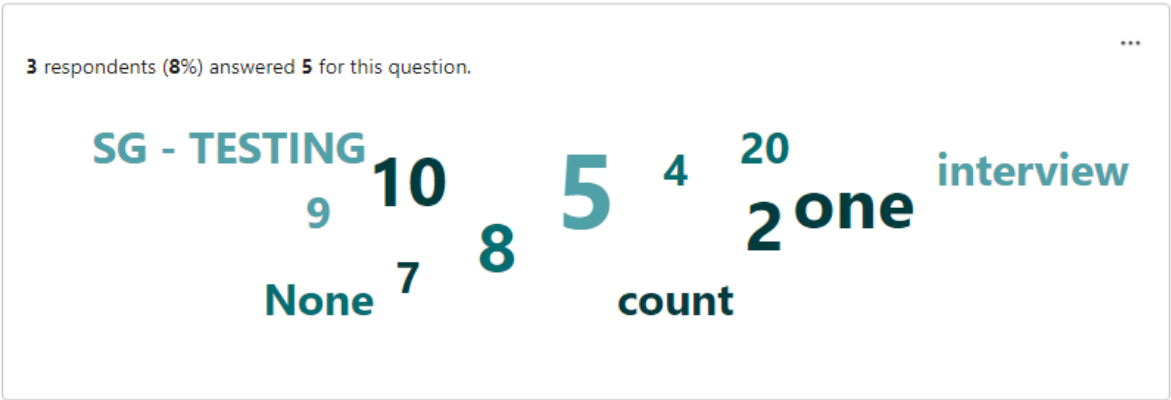
10. In the past three years, How many interviews you have attended?

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses  
"3 "  
"3"  
"5"



11. In the past three years, How many jobs you applied?

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses

"over 300 "  
"6"  
"15"

7 respondents (19%) answered **lot** for this question.



12. What were those roles?

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses

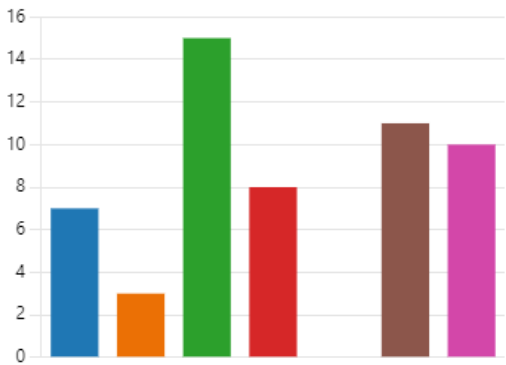
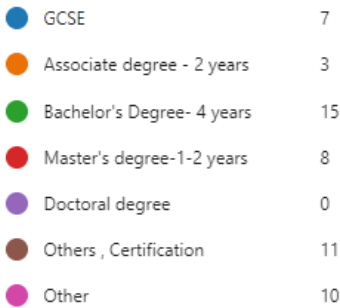
"engineering consultant, tutor, IT technician. "  
"IT Sales Executive, CIO, IT Manager"  
"Management, administration"

6 respondents (17%) answered **Lots** for this question.



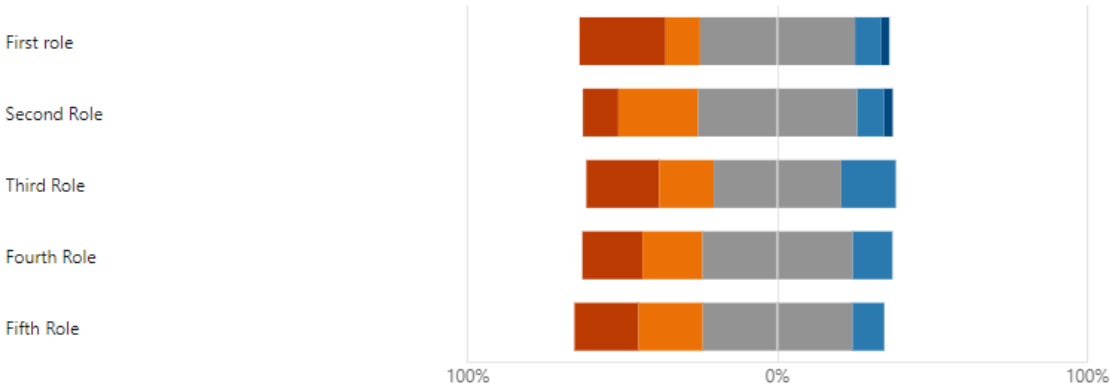
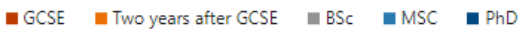
13. What is Your level of education?

[More Details](#)



14. What is the level of education needed in the role?

[More Details](#)



15. Have you failed at the last interview?

[More Details](#)

[Insights](#)

Yes	27
No	7
Other	2

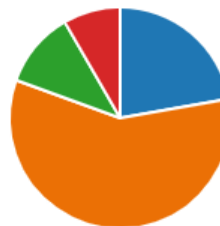


16. Do you think you have fairly Evaluated from your perspective

[More Details](#)

[Insights](#)

Yes	8
No	21
Maybe	4
I don't know	3



17. Do you think they understand your CV and knowledge?

[More Details](#)


[Insights](#)

Yes	9
No	11
Maybe	10
I don't know	6



18. Do you think the employer understood your CV (i.e. your skills, knowledge, experience, education, and abilities) and/or your reason for applying for this role? Explain your answer.

[More Details](#)

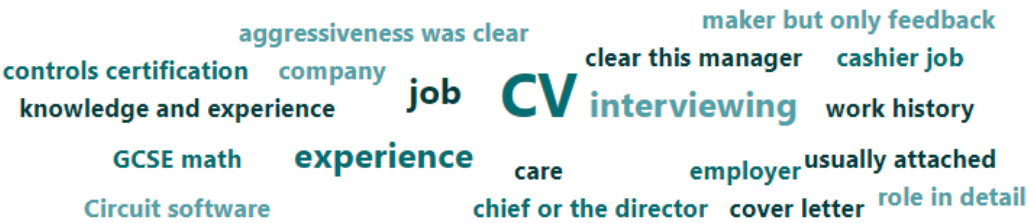
 Insights

25  
Responses

Latest Responses

"perhaps, I don't understand the role in detail, but I also apply because of go..."  
"I think so. Besides the CV, I usually attached a cover letter"

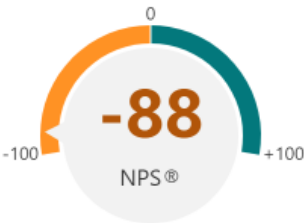
5 respondents (20%) answered CV for this question.



19. Have you been stress at the interview? and what is your stress level, Zero if no stress


[More Details](#)

Promoters	2
Passives	0
Detractors	34

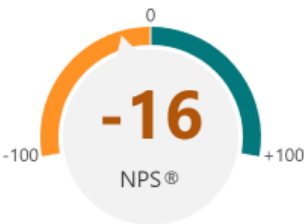


20. Do you think the next interview you will be more stress or less stress? give as an estimate

[More Details](#)

 Insights

Promoters	10
Passives	10
Detractors	16



21. Did you feel stress at the interview? Describe your experience

[More Details](#)

 Insights

26

Responses

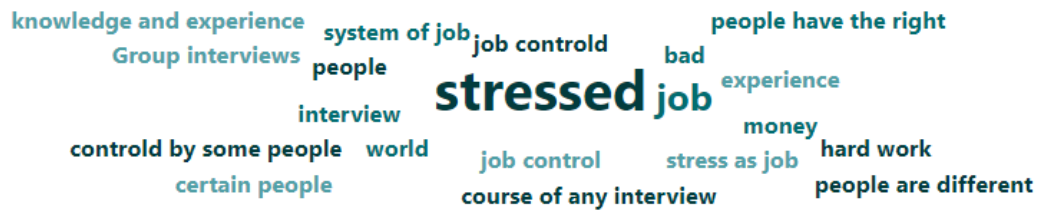
Latest Responses

"I quite a bit worry about my language. Moreover, storytelling and content as...

"I felt the pressure but didn't allow it to turn into stress."

"Just anxious"

9 respondents (35%) answered **stressed** for this question. ...



A word cloud visualization of responses to question 21. The most prominent word is "stressed". Other visible words include "job", "control", "experience", "people", "interview", "system of job", "job control", "bad", "money", "hard work", "stress as job", "course of any interview", "people are different", "world", "certain people", "control by some people", "knowledge and experience", "Group interviews", "people have the right", and "people".

22. What was your feedback about the interview? explain 100-500 words

[More Details](#)

 Insights

36

Responses

Latest Responses

"it's depend on firms. some companies provide formal interview with assess...

"The interviewers were polite and to the point with the questions. The skillset...

"We will be in touch"

9 respondents (25%) answered **interview** for this question. ...

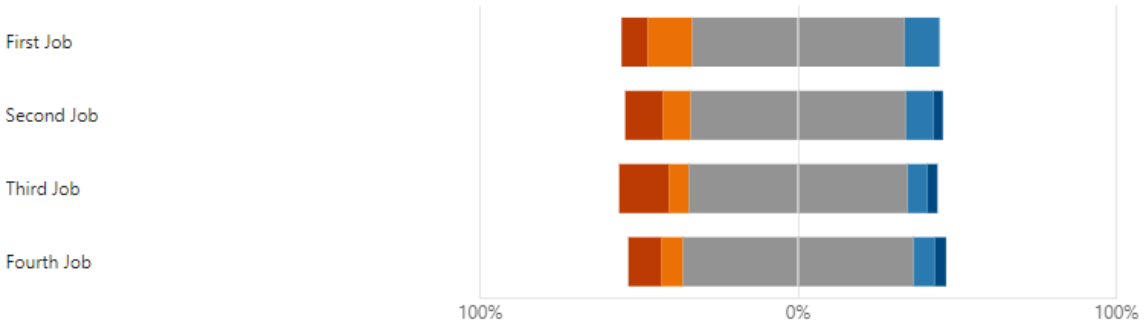


A word cloud visualization of responses to question 22. The most prominent word is "interview". Other visible words include "acting", "feedback", "outcome for some interviews", "multiple interviews", "time", "interview people", "purpose of this interview", "answering", "interviewer", "interview which was at IKEA", "time option", "time and money", "formal interview", "job role", "questions", "interview room", "nerves and the first interview", "point with the questions", "job", and "job control".

23. Can you evaluate the fairness of the interview from your perspective

[More Details](#)

■ I don't Know ■ Fair ■ Unfair ■ very fair ■ no comment



24. Do you suggest a way to improve the interview? Please provide 100- 500 words.

[More Details](#)

[Insights](#)

36  
Responses

Latest Responses

"\_"

"N/A"

"Not every role requires tests like GMAT. Some more experienced interviewee..."

6 respondents (17%) answered **recorded** for this question.

word cloud containing terms such as: suitability of the candidate, open to experiences, point system, clear, experience of the candidate, skills and experience, role, fair, recorded, candidate, people, test, interview procedures, feedback after the interview, information about the interview, job and also the interview, candidate - discuss, job centre.



25. Would you accept a job you are overqualified for, please explain

0  
Responses

Latest Responses

26. In your opinion, what is the best method for evaluating the best candidate for this role? Describe your answer for each role.

[More Details](#)

 Insights

35  
Responses

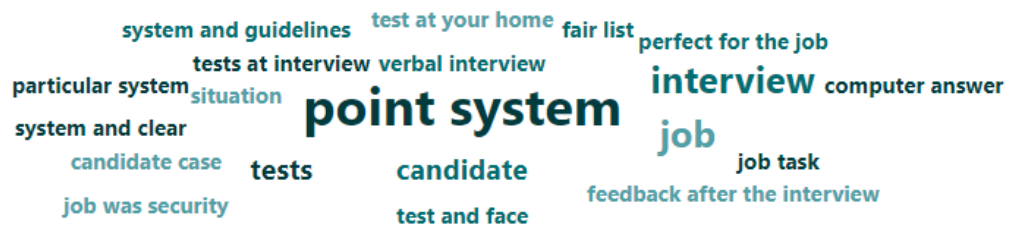
Latest Responses

"provide various ways to test candidates, trying to understand previous expe..."

"Present a real case scenario and ask the candidate how would they deal wit..."

"Conversations/chats"

7 respondents (20%) answered **point system** for this question.



system and guidelines test at your home fair list perfect for the job  
tests at interview verbal interview interview computer answer  
particular system situation point system job  
system and clear candidate case tests candidate job task  
job was security test and face feedback after the interview

27. Do you think overqualified is a genuine cause for rejection?

[More Details](#) [Insights](#)

20  
Responses

Latest Responses

"Yes for example, I used to apply as a part-time retailer at TESCO, I also hav...  
"Nope"  
"Sometimes. An overqualified person may or may not quickly become despo...

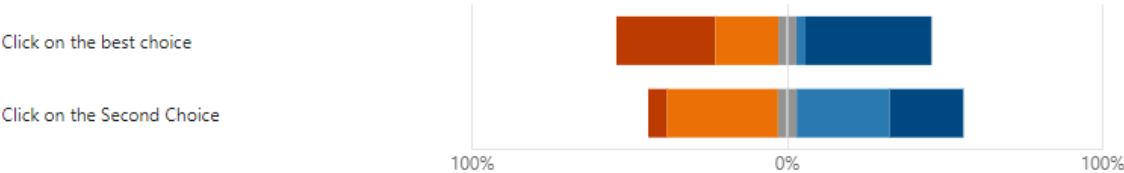
6 respondents (30%) answered **game** for this question.



28. Who do you think should make the decision to hire you or evaluated you at the interview to avoid management biases

[More Details](#)

■ Direct Manager   ■ Chief Knowledge Management Officer   ■ Department Manager   ■ Department Director  
■ Human resources or a universal body as centralised hiring body to the entire company



 **Insights**

*"Nope."*

A word cloud visualization of the text. The words are arranged in a circular pattern, with 'control' and 'interview' being the largest and most prominent. Other visible words include 'job', 'people', 'difference between criminal', 'doctors and all other jobs', 'interview process', 'job society', 'Job become base', 'interview and managers', 'job roles', 'criminal and human', 'interview clear', 'interviews are stressful', 'job interview', 'control job', 'law control', 'waste time', 'criminals are stupid', and 'criminal cares'.

Chapter 9:296

This part is evident in the paid advert

 Receipt for Basil Jfa (Account ID: )

Hi Basil,

Here's your first **Facebook** Ads receipt. Now that you're paying for ads, learn how you're billed:

You'll receive your next bill when your ad costs reach £17.00 or on your monthly billing date, whichever occurs first.

You control how much you spend for ads and how long they run, so we'll never charge you more than the budget that you set.

You can always view your final bill in the Billing section of Ads Manager.

### Summary

AMOUNT BILLED

**£5.00 GBP**

BILLING REASON

**Ad spend since 11 Feb 2020.**

DATE RANGE


**11 Feb 2020, 00:00 - 16 Feb 2020, 23:59**

PRODUCT TYPE

**Facebook Ads**

PAYMENT METHOD

REFERENCE NUMBER

 You can use the reference number to find this charge on your credit card statement.

 Receipt for Basil Jfa (Account ID: )

Hi Basil,

Here's your first **Facebook** Ads receipt. Now that you're paying for ads, learn how you're billed:

You'll receive your next bill when your ad costs reach £17.00 or on your monthly billing date, whichever occurs first.

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**11 Feb 2020, 00:00 - 16 Feb 2020, 23:59**

PRODUCT TYPE

**Facebook Ads**

PAYMENT METHOD

REFERENCE NUMBER

 You can use the reference number to find this charge on your credit card statement.

## This part explains further communication with Facebook

26/04/2023, 12:52

Email - Basil J Andrea - Outlook

### RE: Facebook Support | Job: 1025725851143747

Basil Joseph Andrea <

Thu 27/02/2020 16:38

To: 'Facebook' <case++aazqhrcj3sabnk@support.facebook.com>

Dear

I haven't delete anything

You just block this link which has nothing wrong,

The PhD study is my study

And the company is my company. Now I become a self-employed under this company as this company dissolved but I can function as self-employed and this is perfectly legal by UK law.

Regards

---

**From:** Facebook <case++aazqhrcj3sabnk@support.facebook.com>

**Sent:** Thursday, 27 February, 2020 11:49 AM

**To:** Basil Jfa <b.j.f.andrea@pgr.reading.ac.uk>;

**Subject:** Facebook Support | Job: 1025725851143747

Hi Basil,

Thank you for the information provided.

I have just sent your URL to be manual reviewed as it seems to have some restrictions.

I can also see that your post has been deleted, did you delete it?

As soon as my internal team reaches me out I will make sure to let you know with any updates regarding to your URL.

Kind regards,

**Matheus**

**Concierge | Facebook Support**

>On Wed Feb 26, 2020 11:27:09, Basil Joseph Andrea wrote:

>Dear Matheus

>Sure see below print screen, also see a message for blocking add

>This is the same add you have charged me for advertising it, then you block it.

>This is a PhD study with the link

><http://www.community-centre.net/survey.htm>

>the leading site is my company <http://www.community-centre.net> <<http://www.community-centre.net/survey>.>

>now it is dissolved as a company, and I am working as self-employed under the mentioned website, which is perfectly legal

>[\[cid:image001.png@01D5ECD9.58135CE0\]](#)

>What is the reason you have blocked this add?

>[\[cid:image002.png@01D5ECD9.D2F270E0\]](#)

>[\[cid:image003.png@01D5ECD9.D2F270E0\]](#)

>[\[cid:image004.png@01D5ECDA.B1CF0DA0\]](#)

<https://outlook.office.com/mail/id/AAMkADk3ZWUzYjVjLWYxOTAfNGJmYS1iZmQ4LTdlNGJlZjVlYzMxYgBGAAAAADnalc0NrcvT6qaXVf7y0T4B...> 1/3

26/04/2023, 12:52

Email - Basil J Andrea - Outlook

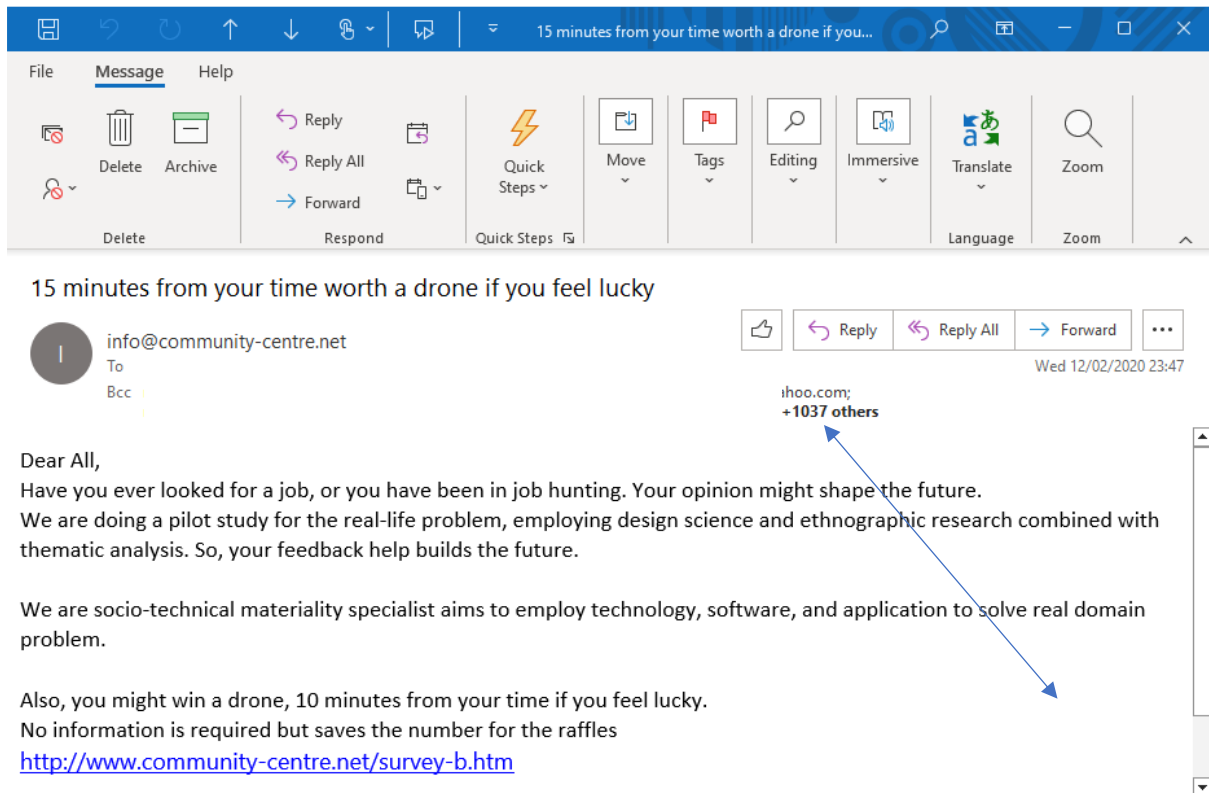
>From: Facebook <[case++aazqhrcj3sabnk@support.facebook.com](mailto:case++aazqhrcj3sabnk@support.facebook.com)>  
>Sent: Wednesday, 26 February, 2020 12:25 PM  
>To: Basil Jfa <[b.j.f.andrea@pgr.reading.ac.uk](mailto:b.j.f.andrea@pgr.reading.ac.uk)>;  
>Subject: Facebook Support | Job: 1025725851143747  
>Hi Basil,  
>Can you kindly clarify your request and give me more information?  
>I need the ad id you are talking about.  
>How Can I find an ad id:  
>Click edit on the ad  
>Go to the ad set level  
>In the top right corner click the icon with the three dots  
>The ad ID is located at the bottom.  
>Kind regards,  
>Matheus  
>Concierge | Facebook Support  
>>On Wed Feb 26, 2020 03:29:21,

>>Dear  
>>The add is  
>><http://www.community-centre.net/survey.htm>  
>>or  
>>[Http:// www.community-centre.net](http://www.community-centre.net)<<http://www.community-centre.net>>  
<<http://www.community-centre.net>>  
>>This was under a company now it is dissolved, and I work as self-employed on this one.  
>>Regards

>>  
>>  
>>From: Facebook <case>  
>>Sent: Wednesday, 26 February, 2020 10:19 AM  
>>To: Basil Jfa <[b.j.f.andrea](mailto:b.j.f.andrea)>  
>>Subject: Facebook Support | Job: 1025725851143747  
>>  
>>Hi Basil,  
>>Hope this message finds you well.  
>>Thank you for contacting Facebook Ad Support. My name is Matheus and I will look over your case.  
>>I have looked into your case and I can see that you have only one ad on your Ads Manager.  
>>Can you please send me the ad id you are talking about? I would also need the blocked URL you are talking about.  
>>I would really appreciate if you can clarify your question as well so I can fully understand your query.  
>>Have a great day and please do not hesitate to reach out to us at Facebook in the future in case any other issue arises.  
>>Thanks,  
>>Matheus  
>>Concierge | Facebook Support  
>>>On Tue Feb 25, 2020 21:41:41, Basil Jfa wrote:  
>>>You have charge me for my PhD study to distribute the link then you block the link can I know why  
>>>and you stated that the post reached over 200 people but no even one click  
>>>Yes, I have listed my PhD study and you block it, is there a way I can understand the reason.

<https://outlook.office.com/mail/id/AAMkADk3ZWUzYjVjLWYxOTAiNGJmYS1iZmQ4LTdlNGJlZjVlYzIxMxYgBGAAAAADnalc0NrcvT6qaXVf7y0T4B...>

## Evidence of email send to 1000 job seekers



## Appendix I



is Ambiguity bias could have impact on employment



Yes, ambiguity bias could have an impact on employment. Ambiguity bias is the tendency to avoid or dislike ambiguous situations, and to seek out clear and certain information. This bias can manifest in different ways in the workplace.



For example, an employer with an ambiguity bias may prefer candidates who have a straightforward and clearly defined skill set, rather than those who have a more diverse or flexible range of skills. This could result in the employer missing out on potentially valuable employees who have the ability to adapt to new challenges.



Is Focalism bias could have impact on employment selection



Yes, focalism bias could have an impact on employment selection. Focalism bias is the tendency to focus too much on a single aspect of a situation and overlook other important factors. This bias can manifest in different ways in the context of employment selection.



For example, an interviewer with a focalism bias may place too much emphasis on a candidate's academic qualifications or work experience, and overlook other important factors such as their interpersonal skills, creativity, or problem-solving abilities. This can result in the interviewer making an incomplete or inaccurate assessment of the candidate's potential fit for the job.





Is Authority bias could have impact on employment selection



Yes, authority bias can have an impact on employment selection. Authority bias is the tendency to give undue weight to the opinions or actions of those in positions of authority, and to defer to their judgment even when it may not be warranted. This bias can manifest in different ways in the context of employment selection.



For example, an interviewer with an authority bias may place too much emphasis on a candidate's previous job title or the reputation of their previous employer, and assume that this is an accurate measure of the candidate's abilities and potential fit for the job. This can result in the interviewer overlooking other important factors such as the candidate's skills, experience, or personal qualities.



is Context effect could have impact on employment selection



Yes, context effect could have an impact on employment selection. Context effect refers to the way in which the context in which information is presented can influence the way that it is perceived and evaluated. This bias can manifest in different ways in the context of employment selection.

For example, an interviewer may be influenced by the context in which they interview a candidate, such as the time of day, the setting, or their own mood or mindset at the time. This could result in the interviewer evaluating the candidate differently depending on the context, even if the candidate's abilities or qualifications remain the same.



is Cryptomnesia bias could have impact on employment selection



Yes, cryptomnesia bias could have an impact on employment selection. Cryptomnesia bias refers to the unconscious misattribution of a memory, idea, or thought to one's own original thinking, rather than recognizing that it was derived from an external source. This bias can manifest in different ways in the context of employment selection.



For example, an interviewer with cryptomnesia bias may attribute an idea or suggestion made by a candidate to their own original thinking, and give the candidate less credit than they deserve. This could result in the interviewer undervaluing the candidate's contributions and potential for the job.

Similarly, a candidate with cryptomnesia bias may unintentionally present an idea or skill as their own, when in fact it was learned from a previous employer or colleague. This could lead to the candidate overestimating their own abilities or experience, which could result in a poor fit for the job.

Overall, cryptomnesia bias can impact employment selection by leading to inaccurate assessments of candidates' contributions, skills, or experience. It is important for both employers and candidates to be aware of this bias and strive to evaluate information and ideas in a thoughtful and objective manner, while acknowledging the contributions of others.



is Egocentric bias could have impact on employment selection



Yes, egocentric bias could have an impact on employment selection. Egocentric bias refers to the tendency to view oneself and one's own experiences, beliefs, and values as more important or valid than those of others. This bias can manifest in different ways in the context of employment selection.



For example, an interviewer with egocentric bias may place too much emphasis on candidates who share similar backgrounds, experiences, or values to their own, and overlook other candidates who may have different perspectives or qualities that could be valuable to the job. This could result in the interviewer making biased or incomplete assessments of candidates based on their own personal biases.

Similarly, a candidate with egocentric bias may overemphasize their own strengths or accomplishments, and downplay the contributions or accomplishments of others. This could lead to the candidate appearing self-centered or uncollaborative, which could be a red flag for potential employers.

Overall, egocentric bias can impact employment selection by leading to biased or incomplete assessments of candidates, and potentially overlooking valuable contributions or perspectives. It is important for both employers and candidates to be aware of this bias and strive to evaluate candidates objectively, considering a broad range of factors and perspectives.



is Extrinsic incentives bias could have impact on employment selection



Extrinsic incentives bias could have an impact on employment selection. Extrinsic incentives bias refers to the tendency to focus too much on external rewards, such as money or status, rather than intrinsic motivators, such as job satisfaction or personal fulfillment. This bias can manifest in different ways in the context of employment selection.



For example, an employer with extrinsic incentives bias may prioritize candidates who have a strong track record of earning high salaries or achieving prestigious titles, over candidates who may have a passion for the job or a desire to make a positive impact. This could result in the employer overlooking candidates who may be highly motivated and well-suited for the job, but who may not have a history of high-paying or prestigious positions.

Similarly, a candidate with extrinsic incentives bias may prioritize job offers that offer higher salaries or greater status, over jobs that may align more closely with their personal values or career goals. This could result in the candidate accepting a job that may not actually be a good fit for them in the long run.

Overall, extrinsic incentives bias can impact employment selection by leading to a disproportionate focus on external rewards, rather than intrinsic motivators or a good fit between the candidate and the job. It is important for both employers and candidates to be aware of this bias and strive to evaluate job opportunities based on a broad range of factors, including intrinsic motivators, job fit, and personal values.



is Google affect bias could have an impact on employment selection decision



Yes, Google affect bias could have an impact on employment selection decisions. Google affect bias refers to the tendency to over-rely on the first pieces of information that come to mind when making decisions. This bias can manifest in different ways in the context of employment selection.



Is Group attribution error bias could have an impact on employment selection decision



Yes, group attribution error bias could have an impact on employment selection decisions. Group attribution error bias, also known as the ultimate attribution error, refers to the tendency to attribute positive or negative characteristics to an entire group, based on the actions or characteristics of a few individuals within that group. This bias





is humour affect bias could have an impact on employment selection decision



Yes, humor affect bias could have an impact on employment selection decisions. Humor affect bias refers to the influence of a person's sense of humor on their perceptions of others. This bias can manifest in different ways in the context of employment selection.



For example, an interviewer with humor affect bias may be more likely to hire a candidate who they find funny or who shares their sense of humor, even if the candidate may not be the most qualified or



is Illusion of external agency bias could have an impact on employment selection decision



The illusion of external agency bias could potentially have an impact on employment selection decisions. The illusion of external agency bias refers to the tendency to attribute one's own actions or decisions to external factors, while attributing the actions or decisions of others to internal factors such as their personal traits or abilities.

In the context of employment selection, this bias could potentially lead to an interviewer or hiring manager attributing their own successes or achievements in the hiring process to their skills or abilities



is Impact bias could have an impact on employment selection decision



Impact bias could have an impact on employment selection decisions. Impact bias refers to the tendency to overestimate the impact that future events or outcomes will have on our emotions or overall well-being. In the context of employment selection, this bias could manifest in different ways.



For example, a job candidate may have a strong preference for a certain job or company and believe that being offered the job will greatly impact their overall happiness and well-being. This bias may cause the candidate to put too much emphasis on this specific opportunity and overlook other potential opportunities that could also be a good fit for them.

On the other hand, an employer may overestimate the impact that hiring a certain candidate will have on the success of the company or the team. This bias may cause the employer to overlook other qualified candidates who may also be a good fit for the job.



is Regressive bias could have an impact on employment selection decision



It is possible that regressive bias could have an impact on employment selection decisions.



Regressive bias refers to the tendency to revert to the mean, or to assume that extreme scores or outcomes are likely to move closer to the average over time.

In the context of employment selection, regressive bias could potentially impact decisions made about candidates who have had extreme performance outcomes in the past, such as exceptional or poor job performance. An employer may assume that a candidate who has had exceptional performance in the past is unlikely to continue to perform at that level in the future, and therefore overlook them for a job opportunity. Similarly, an employer may assume that a candidate who has had poor performance in the past is likely to improve and perform closer to the average in the future, and therefore give them more consideration for a job opportunity.



is Regulatory issues bias could have an impact on employment selection decision



Regulatory issues bias could potentially have an impact on employment selection decisions, especially in industries or organizations that are heavily regulated. Regulatory issues bias refers to the tendency to make decisions based on compliance with regulations or policies, rather than on the merits or qualifications of the candidates.



For example, an employer may focus on hiring candidates who meet certain regulatory requirements or possess certain certifications, even if those qualifications are not directly related to the job or may not be the best indicator of a candidate's ability to perform the job. This bias may result in overlooking candidates who may be equally or more qualified, but do not possess the required certifications or meet the regulatory requirements.

On the other hand, regulatory issues bias could also lead to overlooking potential regulatory or compliance risks associated with a candidate. An employer may be more likely to overlook potential red flags or warning signs in a candidate's background if they possess the necessary certifications or meet the regulatory requirements.

Overall, while regulatory compliance is important, it should not be the sole focus of employment selection decisions, and a balanced approach should be taken to ensure that the most qualified candidates are selected.



is Reporting bias could have an impact on employment selection decision



Reporting bias could potentially have an impact on employment selection decisions. Reporting bias refers to the tendency for individuals to selectively report or emphasize certain information while neglecting or downplaying other information. In the context of employment selection, reporting bias could manifest in several ways.

For example, a candidate may selectively highlight certain achievements or experiences on their resume or in an interview, while downplaying or omitting other relevant information that may not be as impressive. This could potentially impact the employer's perception of the candidate's qualifications and lead to biased evaluations.

Similarly, an employer may selectively focus on certain aspects of a candidate's background or experience, while neglecting other relevant information that may be important for making an informed decision. This could potentially lead to biased evaluations and result in overlooking qualified candidates who may not fit the employer's narrow criteria.



is Semmelweis reflex bias could have an impact on employment selection decision



Semmelweis reflex bias is unlikely to have a direct impact on employment selection decisions, as it refers to the tendency to reject new or innovative ideas or information that challenge existing beliefs or practices. However, this bias could indirectly impact employment selection decisions if it leads to a reluctance to consider new or unconventional approaches to hiring or evaluating candidates.

For example, an employer may reject a candidate who has unconventional qualifications or experience because they do not fit the traditional mold of what the employer considers to be a "good" candidate. Alternatively, an employer may be reluctant to adopt new assessment methods or selection criteria because they are unfamiliar or untested, even if they may be more effective at identifying qualified candidates.

In general, it is important to be open to new ideas and approaches in the employment selection process, as this can lead to a more diverse and qualified pool of candidates. Employers should be willing to consider candidates with non-traditional backgrounds or experience if they can demonstrate the necessary skills and qualifications for the job, and should be open to exploring new assessment methods and selection criteria to improve the quality of their hiring decisions.



is Shared information bias could have an impact on employment selection decision



Shared information bias could potentially have an impact on employment selection decisions. Shared information bias refers to the tendency for groups to focus on information that is already known or shared among group members, while neglecting or downplaying information that is unique or held by only a few members of the group.



In the context of employment selection, shared information bias could manifest in several ways. For example, a hiring committee or group may focus on information about a candidate that is already known or commonly shared, such as their education or previous job experience, while neglecting to explore other unique or potentially relevant information that may be held by only a few members of the group.



is Singularity affect bias could have an impact on employment selection decision



Singularity affect bias is unlikely to have a direct impact on employment selection decisions as it refers to the tendency to overemphasize the significance of a single event or factor while neglecting other relevant information. However, this bias could indirectly impact employment selection decisions if it leads to a focus on a single factor, such as a candidate's educational background or work experience, at the expense of other important factors such as soft skills or personality traits.



For example, an employer may focus too much on a candidate's prestigious educational background or previous work experience and overlook other important factors such as their interpersonal skills or ability to work well in a team. Alternatively, an employer may fixate on a single impressive achievement or credential and neglect to consider the candidate's overall fit for the job.



is Social comparison bias could have an impact on employment selection decision



Social comparison bias could potentially have an impact on employment selection decisions. Social comparison bias refers to the tendency for individuals to evaluate themselves or others in comparison to others, rather than on an absolute basis.



In the context of employment selection, social comparison bias could manifest in several ways. For example, an employer may compare a candidate to other candidates who have applied for the same position, rather than evaluating them on their own merits and qualifications. This could potentially lead to biased evaluations and result in overlooking qualified candidates who may not fit the employer's narrow criteria.





is Tip of the tongue phenomenon bias could have an impact on employment selection decision



The tip-of-the-tongue phenomenon bias is unlikely to have a direct impact on employment selection decisions. This phenomenon refers to the experience of knowing a piece of information, such as a person's name or a specific word, but being unable to recall it at a particular moment.



While this bias may be frustrating or embarrassing for individuals, it is unlikely to significantly impact employment selection decisions. However, if a hiring decision is based solely on a candidate's ability to recall specific pieces of information, such as during a memory-based test, then the tip-of-the-tongue phenomenon could indirectly impact employment selection.



is Zero-sum bias could have an impact on employment selection decision



Zero-sum bias could potentially have an impact on employment selection decisions. Zero-sum bias refers to the belief that one person's gain must be balanced by another person's loss, or that resources are fixed and limited, leading to the idea that there is a winner and a loser in any situation.



## Appendix J

[illegible]

## Appendix K

### Definition

The system and a conceptual system?

A system is a set of algorithms connected to support a task, whereas a conceptual system is non-physical. The first conceptual system, "Kelly's personal construct theory", was introduced in 1955. Other scholars who have developed such a system are Bateson, Senge, Quine, Eco, Umpleby, Luhmann, and Wallis (Brown, 2006). What is Bias? There are several definitions of bias; for example, Steinbock and Bonnie (1978) describe a bias as an unequal weight favouring or against an idea or thing and is generally unfair or prejudicial. Biases can be inherent or learned through socialisation; however, this research defines bias as systematic thinking errors.

What is mock bureaucracy?

Mock bureaucracy is a term coined by Gouldner (1954) that describes how some managers do not feel obligated to align their activity with corporation guidelines but instead act in ways that serve their aims. For example, some managers allow smoking in a computer room when monitoring the application because the team is a smoker.

What are an open-loop and a closed-loop?

Argyris developed open-loop and closed-loop management methods to monitor a management system (Distefano, Stubberud, Williams (1967); Argyris, (1976). The open-loop and closed-loop have different shapes and formats. Argyris states that a sophisticated monitoring system is the best organisation's learning and practice. Open-loop systems are a component designed for a specific activity, irrespective of environmental conditions. However, a closed-loop monitors an environment and responds to changes in this environment. Hence, an open-loop and a close-loop work to monitor a control system.

So, control capacity management through over-provisioning is an open loop. In contrast, a load-balancer that detects failure and redirects capacity is a closed-loop. Another example is analysis feedback collected from the survey and reported to management for later correction is open-loop. Conversely, analysis feedback that directly or automatically reflects the outcome is closed-loop.

What is a control system?

The system that is being controlled is based on input and output parameters, So the control system consists of five components: 1) the input; 2) the controlled process, which in this study is the hiring process; 3) the output - which in this case relates to the hiring decision; 4) sensing norm – which in this study relates to the bias in employment; 5) controller to the norm – which in this case is the controller that manages the open- and closed-loop feedback Argyris, Schön, (1974); Jong, Kolthof and Pieper, (2008).

What is Matrix management?

Organisation management methods were developed in the USA aerospace 1950. Matrix management places multiple supervisors or managers to ensure the process is fit for use and purpose. Three components are employed to monitor each process: i) the process owner, ii) the process manager, and iii) the process practitioners - who could be more than one person. Matrix management becomes widely adopted throughout businesses in the 1970s.

What is ITIL?

ITIL was developed by the British government's Central Computer and Telecommunications Agency (CCTA) in the 1980s. ITIL, which has had four subsequent versions, was developed and released over time to codify the best practices in information technology (including vendors' best practices). ITIL offers solutions related to biases and mock bureaucracy through matrix management methods to ensure that the proposed process is fit for use and purpose. Therefore, applying a matrix management method can ensure that the process is fit for use and does not involve any bias Jong, Kolthof and Pieper, (2008).

## Appendix L

Bias list collection of 105 articles listed on Wikipedia

1. Actor-observer bias
2. Adaptive Conservatism
3. Affect heuristics
4. Affinity Bias
5. Ambiguity Effect
6. Anchoring bias
7. Anchoring or focalism
8. Anthropocentric thinking
9. Anthropomorphism
10. Anticipatory Regret
11. Apathy
12. Apophenia
13. Appeal to Authority
14. Appeal to Common Belief
15. Appeal to Consequence
16. Attentional bias
17. Attribute substitution
18. Authority bias
19. Automation bias
20. Availability cascade
21. Availability heuristic
22. Backfire effect
23. Bandwagon effect
24. Base rate fallacy or Base rate neglect
25. Beauty bias
26. Belief bias
27. Ben Franklin effect
28. Berkson's paradox
29. Bias blind spot
30. Bizarreness effect
31. Cheerleader effect
32. Choice-supportive bias
33. Classism
34. Clustering illusion
35. Cognitive biases
36. Compassion fade
37. Confirmation bias
38. Conflicts of interest
39. Conformity bias
40. Congruence bias
41. Conjunction fallacy
42. Conservatism or Regressive bias
43. Consistency bias

44. Context effect
45. Continued influence effect
46. Contrast effect
47. Courtesy bias
48. Cross-race effect
49. Cryptomnesia
50. Curse of knowledge
51. Declinism
52. Decoy effect
53. Default effect
54. Defensive attribution hypothesis
55. Denomination effect
56. Disposition effect
57. Distorted Thinking
58. Dread aversion
59. Dual-process theory
60. Dunning–Kruger effect
61. Duration neglect
62. Dysrationalia
63. Ecological rationality
64. Educational psychology
65. Effect size
66. Efficient-market hypothesis
67. Effort heuristic
68. Effort Justification
69. Egocentric bias
70. Emotional Reasoning
71. Empathy gap
72. Empirical research
73. End-of-history illusion
74. Endowment effect
75. Endowment theory
76. Ensemble Effect
77. Epistemic modal logic
78. Escalation of Commitment
79. Exaggerated Expectations
80. Expectation anchor
81. Experimenter's bias
82. Experimenter's or expectation bias
83. Explanatory coherence
84. Extrapolation
85. Extrapolation Bias
86. Extrinsic incentives bias
87. Fading affect bias
88. False consensus effect
89. False dilemma

90. False distinctiveness
91. False memory
92. False uniqueness bias
93. False-Positive Paradox
94. Familiarity Bias
95. Fascination effect
96. Fast and frugal heuristics
97. Favoritism
98. Focalism
99. Focusing effect
100. Focusing Illusion
101. Forer Effect
102. Forewarning and inoculation
103. Form function attribution bias
104. Framing
105. Framing Effect Reversal
106. Free association
107. Free will
108. Frequency illusion
109. Frequency probability format hypothesis
110. Fringe psychology
111. Functional fixedness
112. Fundamental attribution error
113. Galvanic Skin Response Bias
114. Gender Bias
115. Generation effect (Self-generation effect)
116. Google effect
117. Group attribution error
118. Group Polarization
119. Groupthink
120. Halo effect
121. Halo Error
122. Hard–easy effect
123. Hawthorne effect
124. Hedonic Adaptation
125. Hindsight bias
126. Hindsight Devaluation
127. Homogeneity Bias
128. Horn effect
129. Hostile attribution bias
130. Hostile Media Effect
131. Hot Hand Fallacy
132. Hot-hand fallacy
133. Humor effect
134. Hyperactive Agency Detection
135. Hyperbolic discounting

- 136. Identifiable victim effect
- 137. Ideological Bias
- 138. IKEA effect
- 139. Illicit transference
- 140. Illusion of control
- 141. Illusion of external agency
- 142. Illusion of transparency
- 143. Illusion of validity
- 144. Illusionary truth effect
- 145. Illusory correlation
- 146. Illusory superiority
- 147. Illusory truth effect
- 148. Impact bias
- 149. Information bias
- 150. Ingroup bias
- 151. Insensitivity to sample size
- 152. Interoceptive bias
- 153. Intuition
- 154. Irrational escalation or Escalation of commitment
- 155. Law of the instrument
- 156. Less-is-better effect
- 157. Leveling and sharpening
- 158. Levels-of-processing effect
- 159. List-length effect
- 160. Look-elsewhere effect
- 161. Lookism
- 162. Loss aversion
- 163. Memory errors and biases
- 164. Mere exposure effect
- 165. Modality effect
- 166. Money illusion
- 167. Mood-congruent memory bias
- 168. Moral luck
- 169. Naïve realism
- 170. Negativity bias or Negativity effect
- 171. Neglect of probability
- 172. Next-in-line effect
- 173. Normalcy bias
- 174. Not invented here
- 175. Observer-expectancy effect
- 176. Omission bias
- 177. Optimism bias
- 178. Ostrich effect
- 179. Outcome bias
- 180. Outgroup homogeneity bias
- 181. Overconfidence bias



- 182. Pareidolia
- 183. Parkinson's law of triviality
- 184. Part-list cueing effect
- 185. Pessimism bias
- 186. Picture superiority effect
- 187. Planning fallacy
- 188. Prejudices
- 189. Present bias
- 190. Processing difficulty effect
- 191. Projection bias
- 192. Pseudocertainty effect
- 193. Pygmalion effect
- 194. Racism
- 195. Reactance
- 196. Reactive devaluation
- 197. Recency illusion
- 198. Regressive bias
- 199. Regulatory issues
- 200. Reminiscence bump
- 201. Reporting bias & social desirability bias
- 202. Restraint bias
- 203. Rhyme as reason effect
- 204. Salience bias
- 205. Selection bias
- 206. Self-relevance effect
- 207. Self-serving bias
- 208. Semmelweis reflex
- 209. Sexism
- 210. Shared information bias
- 211. Similarity attraction bias
- 212. Singularity effect
- 213. Social biases
- 214. Social comparison bias
- 215. Social desirability bias
- 216. Source confusion
- 217. Spotlight effect
- 218. Status quo bias
- 219. Stereotypical bias
- 220. Subadditivity effect
- 221. Subjective validation
- 222. Suggestibility
- 223. Surrogation
- 224. Survivorship bias
- 225. System justification
- 226. Testing effect
- 227. The Overjustification Effect

- 228. The Planning Fallacy
- 229. The Regression Fallacy
- 230. The Sunk Cost Fallacy
- 231. The Third-Person Effect
- 232. The Trait Ascription Bias
- 233. The Ultimate Attribution Error
- 234. The Von Restorff Effect
- 235. Third-person effect
- 236. Time-Discounting Bias
- 237. Time-saving bias
- 238. Tip of the tongue phenomenon
- 239. Trait ascription bias
- 240. Trait Negativity Bias
- 241. Transitivity
- 242. Travis Syndrome
- 243. Triviality Bias
- 244. Ultimate attribution error
- 245. Ultimatum Game
- 246. Uncertainty Effect
- 247. Unit bias
- 248. Urge to Act Bias
- 249. Valence Effect
- 250. Value Attribution
- 251. Verbatim effect
- 252. Victim Effect
- 253. Weber–Fechner law
- 254. Women are a wonderful effect
- 255. Zero-sum bias