

**Adopting collective hybrid intelligence principles to enhance corporate innovation
and process efficiencies.**

Student number: 21828416

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

1 November 2022

ABSTRACT

Collective Hybrid Intelligence (CHI) is a proposed paradigm in which collective entities, such as human intelligence, collective intelligence, and artificial intelligence, combine their unique abilities to form an entity greater than its individual sections. In a future era of automation and robotic technology, CHI could enable organisations to overcome the limitations of traditional intelligence and create highly effective and innovative companies based on shared intelligence and collective creativity. As we move into an age of collective hybrid intelligence (CHI), the need for data and analytics to support decision processes becomes more significant as we find ourselves in an environment in which human judgement increasingly needs to be supported by AI algorithms that have access to vast amounts of data and can analyse the insights to provide recommendations. This study will explore the factors of CHI principles and how its adoption could enhance corporate innovation and process efficiencies.

KEYWORDS

Collective Hybrid Intelligence, Collective intelligence, Artificial Intelligence, Human Intelligence, Human-Computer Symbiosis, Robotic Process Automation, Workforce Reskilling and Upskilling, Organisational Design, Leadership, Operational Systems, Digital Transformation Strategy, Capacity Augmentation, Fourth Industrial Revolution

DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Ernst Taljaard

29 November 2022

TABLE OF CONTENTS

1	Chapter 1 - Introduction to the Research Problem	1
1.1	Introduction	1
1.2	Background to the research	2
1.3	Research Motivation	3
1.3.1	Business Rationale for the Research	4
1.3.2	Academic Rationale for the Research	4
1.4	Purpose of Research	4
1.5	Conclusion	5
2	Chapter 2 - Theory and Literature review	6
2.1	Introduction	6
2.2	Business Landscape	6
2.2.1	New competencies	7
2.2.2	Corporate Innovation	8
2.3	Leadership	9
2.3.1	Strategic Leadership	9
2.3.2	Data-driven Decision-making	11
2.4	Techology	12
2.4.1	Technological Advancements	12
2.4.2	Technological Displacement	14
2.5	Collective Hybrid Intelligence	14
2.5.1	Human Intelligence	16
2.5.2	Artificial Intelligence	17
2.6	Change Management	18
2.6.1	McKinsey 7S Model	18
2.6.2	Hard factors	19
2.6.2.1	Strategy	19
2.6.2.2	Structure	20
2.6.2.3	Systems	21

2.6.2.4	Soft Factors	21
2.6.2.5	Style	21
2.6.2.6	Staff	22
2.6.2.7	Skills	24
2.6.2.8	Shared Values	25
2.7	Conclusion	26
3	Chapter 3 - Research Questions	27
3.1	Introduction	27
3.2	Research Question one	27
3.3	Research Question two	28
3.4	Conclusion	28
4	Chapter 4 - Research Methodology and Design	29
4.1	Research question	29
4.2	Choice of research design	29
4.2.1	Purpose of research design	29
4.2.2	Philosophy	30
4.2.3	Approach selected	30
4.2.4	Methodological choices	30
4.2.5	Strategy	30
4.2.6	Time horizon	31
4.3	Proposed research methodology	31
4.3.1	Population	31
4.3.2	Unit of analysis	31
4.3.3	Sampling method and size	31
4.3.4	Measurement Instrument	32
4.3.5	Data gathering process	32
4.3.6	Analysis approach	33
4.3.7	Quality controls	33
4.3.8	Limitations	34

1. Chapter 5 - Findings	35
4.4 Introduction	35
4.5 Description and context of participants	35
4.5.1 Participant Background	37
4.5.2 Data Saturation	37
4.6 Results: Research Question 1	39
4.6.1 Theme 1 – Talent Management	39
4.6.1.1 Training	40
4.6.1.2 Soft Skills	42
4.6.1.3 Analytical Skills	43
4.6.1.4 Morale	45
4.6.2 Theme 2 – Change Management	47
4.6.2.1 Change Management	47
4.6.3 Theme 3 – Leadership	49
4.6.3.1 Strategic Innovative Leadership	49
4.6.3.2 Change Agent	50
4.6.4 Theme 4 - Culture	53
4.6.4.1 Culture of innovation	53
4.6.5 Theme 5 – Technology	54
4.6.5.1 Data and Analytics	54
4.6.5.2 Augmenting Human Capacity	55
4.6.6 Summary of Research Question 1 Findings	58
4.7 Results Research Question 2	59
4.7.1 Theme 1 – Talent Management	59
4.7.1.1 Training	59
4.7.1.2 Skills	61
4.7.2 Theme 2 - Leadership	63
4.7.2.1 Strategic Leadership	63
4.7.2.2 Data Driven Decision-Making	64
4.7.3 Theme 3 - Change Management	65
4.7.3.1 Creating Awareness	65

4.7.3.2	Perception of value	66
4.7.3.3	Disarm the Threat of Technology	68
4.7.4	Theme 4 – Technology	70
4.7.4.1	Identify the Role of AI	70
4.7.4.2	Increased Capacity	73
4.7.5	Theme 5 - Culture	74
4.7.5.1	Culture of Technological Trust and Learning	74
4.7.6	Summary of Research Question 2 Findings	75
5	Chapter 6 - Discussion of Findings	77
5.1	Introduction	77
5.2	Common “Soft” Themes for Research Questions One and Two	77
5.2.1	Theme 1 – Talent Management	77
5.2.1.1	Training	77
5.2.1.2	Soft Skills	78
5.2.1.3	Analytical Skills	79
5.2.1.4	Morale	80
5.2.2	Theme 2 - Leadership	81
5.2.2.1	Strategic Leadership	81
5.2.2.2	Change Agent	83
5.2.2.3	Data-Driven Decision-Making	84
5.2.3	Theme 3 – Culture	84
5.2.3.1	Innovative Culture	84
5.2.3.2	Learning Culture	85
5.3	Common “Hard” Themes for Research Question One and Two	85
5.3.1	Theme 4 – Change Management	85
5.3.1.1	Creating Awareness	86
5.3.1.2	Perception of Value	86
5.3.1.3	Disarm the Threat of Technology	87
5.3.2	Theme 5 – Technology	87
5.3.2.1	Data and Analytics	87
5.3.2.2	Emerging Technologies	88
6	Chapter 7 - Conclusion and Recommendations	90

6.1	Introduction	90
6.2	Conclusion of Research Findings	90
6.2.1	Research Questions	91
6.2.2	“Soft” Themes for Research Question One and Two	92
6.2.2.1	Theme 1 – Talent Management	92
6.2.2.2	Theme 2 – Leadership	93
6.2.2.3	Theme 3 – Culture	94
6.2.3	“Hard” Themes for Research Question One and Two	95
6.2.3.1	Theme 4 – Change Management	95
6.2.3.2	Theme 5 – Technology	95
6.3	Proposed Model	97
6.4	Application of the Framework	97
6.5	Implications for stakeholders	98
6.6	Research Limitations	98
6.7	Future Directions	99
7	Reference List	100
8	Appendix A – interview guide	116
8.1	Explanation of the research	116
8.2	Interview Questions	117
9	Appendix B – Consent Form	118
10	Appendix C – Ethical Clearance	119
11	Appendix D - ATLAS TI Codegroups	120
11.1	Research Question 1	120
11.2	Research Question 2	120

FIGURES

Figure 1 - Concepts related to Collective Hybrid Intelligence	18
Figure 2 - CHI factors enhancing corporate innovation	63
Figure 3 - CHI factors enhancing process efficiencies	81

TABLES

Table 1 - Research interview participants	42
Table 2 - Number of new themes	43
Table 3 - Themes related to Corporate Innovation	103
Table 4 - Themes related to Process Efficiencies	103

CHAPTER 1 - INTRODUCTION TO THE RESEARCH PROBLEM

1.1 INTRODUCTION

The emergence of the Fourth Industrial Revolution (4IR) brings about large-scale technological innovation, which necessitates significant changes to the business environment. Organisations are spending significant time and resources to harness technologies, such as Artificial Intelligence (AI), Robotic Process Automation (RPA), Advanced Analytics (AA) and the Internet of things (IoT) to develop new systematic processes by combining the organisational and digital domains of the world (Jarrahi, 2018; Agostini & Filippini, 2019; Ghobakhloo, 2020; Oztemel & Gursev, 2020). The adoption of advanced technologies has proven to have a significant impact in providing support to the business function, re-evaluation and aligning the business models and identifying improved ways of working (Pillai, Yadav, Sivathanu, Kaushik & Goel, 2021). However, even though advanced technologies can provide the foundation for improved efficiencies and innovative new business models, it is simply not enough to spend money on digital infrastructure, data and technologies in isolation. New structures, operational processes, skills and routines are required to create value through advanced technologies (Sjödin, Parida, Palmié, & Wincent, 2021).

To embrace technological innovation, companies must reconsider human and AI capabilities and examine how collective symbiosis can be achieved between employees and AI to ultimately accomplish sustainable Collective Hybrid Intelligence (CHI) (Jarrahi, 2018). Leaders have not fully grasped the extent of economic and ethical factors accompanying AI and its widespread impact on efficiency, reliability, technological change, organisational culture and even human life (Duan, Edwards, & Dwivedi, 2019; Pappas). However, most business leaders appreciate that upskilling and reskilling employees are cost-effective and have substantial long-term organisational and societal benefits (World Economic Forum, 2020).

Many organisations have discovered that advanced technologies and AI algorithms do not correlate to definitive answers but offer tentative solutions, which still need human interpretation and action to create valuable outcomes (Tarafdar, Beath, & Ross, 2019; von Krogh, 2018). It is therefore crucial that organisations engage in digital transformation to

develop artificial capabilities infused into the organisational model in order to create and maintain a competitive advantage in an era of digitisation (Iansiti & Lakhani, 2020).

The optimal process to collectively merge human intelligence and AI technologies into existing organisational systems and contexts is an ongoing topic of research (Tortorella & Fettermann, 2017; Jarrahi, 2018) and is therefore a central part of this research. This topic is significant for large enterprises to remain relevant and retain their talent and intellectual property while augmenting their technological advantage and shrinking the ever-growing skills gap (World Economic Forum, 2020). An exploratory study will be carried out to examine the factors of CHI that could enhance corporate innovation and process efficiencies.

1.2 BACKGROUND TO THE RESEARCH

Humans have holistic, intuitive and creative thinking abilities, which are used to make unconventional and creative decisions. Conversely, AI is highly analytical and largely incapable of mimicking the reasoning behind human intuition and problems solving in these areas (Guszcza, Lewis & Evans-Greenwood, 2017). Although the individual characteristics of analytical thinking and intuitive reasoning are both significant on their own, they are not significantly adequate for optimal business performance. It is therefore essential for leaders to find the optimal collaborative balance between humans and AI to ensure imminent competitive advantage (Jarrahi, 2018).

This symbiosis between humans and AI is referred to as Collective Hybrid Intelligence (CHI). It is grounded on the principle that humans and computers have harmonising talents that can be combined to augment each other (Dellermann, Ebel, Söllner & Leimeister, 2019). In practice, this means that human workers are no longer limited to performing human-specific tasks. Instead, they are now able to collaborate with technology to undertake a more extensive range of tasks with improved efficiency. This means increased productivity and efficiency for companies since more activities can be performed within a given time frame.

The material decline in the cost of computing through IoT and Cloud Computing created substantial economic incentives for organisations to introduce AI as a substitution for human labour (Frey & Osborne, 2017). Nevertheless, AI tasks ultimately depend on humans to develop, maintain and manage the procedures and rules that drive the

technology (Kazancoglu & Ozkan-Ozen, 2018). Guszczka et al. (2017) call attention to AI's lack of reasoning, creativity, and ability to show genuine empathy and build on the notion that human interaction is needed to increase productivity. Wilson and Daugherty (2018) argue that employee interaction with AI will form a symbiotic partnership. However, this partnership will require a strong foundation of soft skills, including critical thinking, collaboration, leadership, innovation, and emotional intelligence on the human side.

The literature around HI, AI and CHI is developing rapidly. However, a gap remains in the literature related to the future expectations of employees, changes in various job profiles and renewing of employee skills to meet these expectations (Kazancoglu & Ozkan-Ozen, 2018). Experts believe digitisation and the emergence of labour-saving technologies contribute to the large-scale elimination of lower-skilled jobs while countless new opportunities will be created in areas such as software and automation engineering, machine learning and systems design (Brougham & Haar, 2018; Frey & Osborne, 2017). To adopt CHI, employee skills must be constantly renewed to keep them equipped with the skills required for human-computer symbiosis (Wilson & Daugherty, 2018). The World Economic Forum (2020) highlighted the increasing relevance of constant skill renewing and the augmentation of jobs with AI capabilities. If the future of work implies constant transformation, triggering lifelong learning requirements, then the emphasis on talent management becomes increasingly important for CHI adoption (van Hoek et al., 2020).

1.3 RESEARCH MOTIVATION

The rapid pace of technological innovation in the business landscape necessitates significant investments in technologies and digital talent management to provide large organisations with the ability to remain competitive while also adapting and renewing their organisational landscape to adopt new technologies. Organisational design, culture, systems and talent management are vital for CHI adoption. Despite this, no empirical data exists to indicate the best systematic arrangement for a hybrid human-computer workforce.

The implications of technological innovation on jobs in 4IR are significantly more severe than in previous revolutions (Huang & Rust, 2018). It blurs the lines between humans and technology, consolidating the physical and digital spheres and is expected to increase the gap between organisations that are prepared for 4IR and those that are not (Armstrong,

Parmelee, Santifort, Burley & Van Fleet, 2018). Large enterprises worldwide are moving towards adopting AI technologies, making it increasingly important for leaders to find the optimal collaborative balance between humans and AI to ensure an imminent competitive advantage (Jarrahi, 2018).

1.3.1 Business Rationale for the Research

This research is relevant to large enterprises and aims to build on the existing knowledge by studying the factors contributing to the effective adoption of CHI. Technological advancements force large enterprises to reimagine how they work to remain competitive (Armstrong et al., 2018), which may include reviewing the efficiency of organisational structures, strategy, values, management style, systems, staff and skills (CFI, 2022). Frey and Osborne (2017) point out that several low-skill jobs are vulnerable to redundancy through technological unemployment. Considering the effects of large-scale headcount reduction on the economy, the social environment and the morale of the workforce, it would be beneficial for organisations to understand the effects that CHI adoption could have on their competitive landscape (Jarrahi, 2018).

1.3.2 Academic Rationale for the Research

What factors of collective hybrid intelligence principles would enhance corporate innovation and process efficiencies? By analysing the “hard” and “soft” factors of Mckinsey’s 7S model, the study aims to contribute to the extant literature on CHI and its impact on corporate innovation and overall process efficiencies. Specifically focussing on the enhancement of corporate innovation and process efficiencies through the adoption of CHI.

1.4 PURPOSE OF RESEARCH

The primary objective of the research is to discover the factors of CHI adoption that would enhance corporate innovation and process efficiencies. In order to gain a deeper understanding of the problem, the following research question is proposed:

Which “hard” and “soft” factors of collective hybrid intelligence adoption could enhance corporate innovation and process efficiencies when adopted in large organisations?

The aim of the research is to gain insights into the following:

1. What are the key “hard” factors of CHI adoption that may enhance corporate innovation within large enterprises?
2. What are the key “soft” factors of CHI adoption that may enhance corporate innovation within large enterprises?
3. What are the key “hard” factors of CHI adoption that may enhance process efficiencies within large enterprises?
4. What are the key “soft” factors of CHI adoption that may enhance process efficiencies within large enterprises?

By gaining a deeper understanding of the areas expressed above, the research aims to build on the existing literature by analysing the feedback received from participants. The research intends to identify the “hard” and “soft” organisational factors that may enhance corporate innovation and process efficiencies through the adoption of CHI principles.

1.5 CONCLUSION

Large-scale technological innovation brought about by 4IR necessitates significant changes to the business environment. Large enterprises are rapidly adopting AI technologies and finding improved ways of working (Pillai et al., 2021). They are reconsidering human and AI capabilities to ultimately establish an environment where human-computer collaboration is efficient and sustainable (Jarrahi, 2018).

This chapter introduced the research by illustrating the research problem from academic and business perspectives. A research question explaining the purpose of the study was provided, together with the objectives of the research. In Chapter 2 a comprehensive literature review is provided, followed by additional information on the research questions in Chapter 3.

CHAPTER 2 - THEORY AND LITERATURE REVIEW

2.1 INTRODUCTION

This chapter presents an overview of the literature on Collective Hybrid Intelligence (CHI), technological advancements, new competencies, and Mckinsey's "hard" and "soft" elements for change management. The literature review starts by introducing the business landscape, technological advancements and new competencies that have been introduced during this era. A discussion of CHI follows, which defines the phenomenon, sets out the contrasting academic views and explains its importance in large organisations. The literature review then explores the elements of Mckinsey's "hard" and "soft" factors, indicating their relevance and importance to the study.

2.2 BUSINESS LANDSCAPE

The business landscape is fluid, constantly evolving and becoming increasingly competitive. This is exacerbated by technological advancement, progressive innovation and an increased level of unpredictability brought about by regular innovative disruptions. (Lee & Trimi, 2021; Jesse, 2018). Understanding the business landscape and the future is essential for business leaders seeking to thrive and remain relevant in an ever-changing environment.

The transformation of the business landscape is being driven by several factors, including disruptive technology, changes in customer behaviour and preferences, the increasing role of data in decision-making, increasing regulation, and the need to innovate to remain competitive (Tarafdar, Beath, & Ross, 2019). The evolution of corporate innovation is directly impacted by these forces.

Technological innovations that disrupt the status quo provide the opportunity for organisations to create new business models and compete for customers in new ways. However, even though technology can be a powerful tool for collecting, analysing and using intelligence, it should not be the only factor considered when developing a business strategy. In conjunction with technological factors, the organisation's skills, leadership,

organisational structures, and operational processes should also be considered when developing a CHI adoption strategy (Sjödín, Parida, Palmié, & Wincent, 2021).

Many organisations have discovered that AI technologies do not correlate to definitive answers but offer tentative solutions, which still need human interpretation and action to create valuable outcomes (Tarafdar, Beath, & Ross, 2019; von Krogh, 2018). Moreover, the advent of the 4IR has redefined the collaborative abilities of humans and machines and how humans prefer to work with machines (Uygun, 2021). It is, therefore, crucial that organisations engage in digital transformation to develop artificial capabilities infused into the organisational model in order to create and maintain a competitive advantage in an era of digitisation (Iansiti & Lakhani, 2020). Taking advantage of a collective hybrid intelligence approach can help organisations identify new growth opportunities and create competitive advantages. The following are some topics that would affect organisational innovation and process efficiencies.

2.2.1 New competencies

The advent of 4IR and the adoption of AI technologies has contributed significantly to the organisational need to find new ways of work. In addition to the disruption caused by COVID-19 lockdowns and the economic recession, technological innovation will transform the business landscape, including jobs and skills, by 2025 (WEF, 2020). Gupta (2021) points out that the skill count required per job realized an annual increase of 10% since 2017 due to constant technological innovation.

While a considerable amount of the recent rhetoric assumes that job roles will be fully automated, a distinct trait of most AI applications is the ongoing need for human interaction. Interaction is needed to assess AI recommendations, confirm the AI suggested action, or act as a support should the AI process fail (Dwivedi et al., 2021). Human workers will continue to work with IA technologies in a symbiotic partnership, but this partnership will require a strong foundation of soft skills, like critical thinking, collaboration, leadership, innovation and emotional intelligence (Wilson & Daugherty, 2018).

Literature indicates that new opportunities will be created in areas such as software and automation engineering, machine learning and systems design (Brougham & Haar, 2018;

Frey & Osborne, 2017). Furthermore, human workers are being promoted in the symbiotic value chain to concentrate on exploiting intuitive human qualities to resolve strategy and integration difficulties as part of a hybrid human-computer workforce (Makridakis, 2018).

2.2.2 Corporate Innovation

Corporate innovation is the process by which organisations incorporate new innovative opportunities into their existing business models. It is the primary driver of organisational and economic growth (Cummings & Knott, 2018). From a classical point of view, corporate innovation encompasses a variety of organisational processes or activities reaching beyond the introduction of new products. It can include new operational methods, exploitation of new markets, changes in the supply chain, and new business models (Schumpeter, 1934). Furthermore, Kratzer, Meissner and Roud (2017) added a broad definition of corporate innovation that goes well beyond research and development alone. They defined corporate innovation as the result of the strategic and deliberate application of existing knowledge and skills, with an additional emphasis on the openness to incorporate the skills and knowledge of outside parties (Kratzer, Meissner & Roud, 2017; Vanhaverbeke & Cloudt, 2014).

It is essential for organisations to continuously innovate and introduce new products to remain competitive and relevant in today's competitive business landscape (Caputo, Cillo, Candelo & Liu, 2019). As technology advances, customer expectations increase, and organisations must be willing and able to adapt its business model to meet the changing demands of the marketplace. New innovation models require new methods of interaction and collaboration to foster the development of new products and processes in diverse contexts (Saviano, Caputo, Mueller & Belyaeva, 2018). Therefore, the innovation management process becomes a relevant aspect of operations in many organisations (Scuotto, Santoro, Bresciani & Del Giudice, 2017). It is a methodical approach for creating a work environment that encourage and fosters the development of innovative ideas for products, services, workflows and methodologies by nurturing the innovative, imaginative and creative abilities of employees (Caputo, Cillo, Candelo & Liu, 2019).

Several theoretical stances have been proposed for analysing innovative processes, including institutional theory, dynamic capabilities, cognitive theory, resource-based view,

dynamic capabilities theory, market orientation perspective and sociotechnical approaches (Caputo, Cillo, Candelo & Liu, 2019; Huizingh, 2011; Garud, Tuertscher & Van de Ven, 2013). The majority of these theories consider technical skills a source of process innovation, whereas process innovation is viewed as a catalyst for the comprehension of the organisational value of technical skills (Caputo, Cillo, Candelo & Liu, 2019).

The ultimate goal of corporate innovation is to enhance productivity and profitability while improving the products and services that they offer to customers (Kratzer, Meissner & Roud, 2017). However, a common challenge associated with corporate innovation is the potential requirement for significant upfront investment to develop new products and technologies. Developing innovative products can be time consuming and costly, especially in industries where significant research and development costs are required. Kiss, Cortes and Herrmann (2022) suggests the use of exploitative innovation to circumvent problems such as limited access to financial capital. Exploitative innovation, also known as bricolage, refers to the incremental improvement of existing products by leveraging available capabilities and knowledge to meet the immediate needs of customers (Koryak, Lockett, Hayton, Nicolaou & Mole, 2018).

The essential features of most innovations in organisations are a combination of existing technologies and knowledge to fill a particular purpose (Kratzer, Meissner & Roud, 2017). Therefore, this study focused on how human intelligence (knowledge) and artificial intelligence (technology) could enhance corporate innovation individually, collectively, and collaboratively.

2.3 LEADERSHIP

2.3.1 Strategic Leadership

Organisations have always strived to innovate new products, processes, and services in their core business to stay ahead of the competition (Mitra, Gaur, & Giacosa, 2019). This drive has been exacerbated by the advancement in emerging technologies and requires organisations to be fluid to remain competitive. Organisations must therefore invest in leaders who can strategically manage, promote innovation and drive change within their

organisation (Cummings & Knott, 2018). The term "strategic leadership" is often used interchangeably to refer to both a specific leadership style and the leadership found at the highest levels of an organisation. In the context of this study, the term "strategic leadership" refers to leadership styles that drive alignment and action across the organisation towards the execution of strategic, innovative initiatives and objectives. Strategic leadership is the process by which leaders effectively influence strategic change or innovation to achieve desired outcomes within an organisation (Samimi, Cortes, Anderson & Herrmann, 2020). It has been shown to result in higher performance and productivity compared to transactional and bureaucratic leadership styles (e.g. servant leadership) (Samimi, Cortes, Anderson & Herrmann, 2020).

Leaders within organisations play a key role in the development and implementation of new strategies, products, and services as they are well-positioned to have a holistic view of their organisation and to understand the impact of new initiatives on their organisation (Cummings & Knot, 2018; Tabesh, Vera, & Keller, 2019). Studies have also shown that future-focused leaders are more likely to identify opportunities, threats and changing technology and market trends, which results in a higher rate of proactiveness and innovation (Nadkarni & Chen, 2014). However, in order for these initiatives to be successful, organisations need to have exemplary leadership and strategy in place.

Existing literature suggests that highly proactive leaders have an increased likelihood of pursuing both exploratory and exploitatively innovation (Kiss, Cortes & Herrmann, 2022). The ability of a leader to pursue both exploratory and exploitatively innovation demonstrates organisational ambidexterity, which facilitates the relationship between a leader's organisational performance and leader proactiveness (Vera, Bonardi, Hitt & Withers, 2022).

Research suggests a positive correlation between strategic leadership and organisational innovativeness, based on the idea that effective strategic leadership entails having a solid vision or direction for the company that fosters a creative and innovative culture in which employees feel empowered to contribute their best ideas without fear of judgment or punishment (Palladan, Abdul Kadir & Yen, 2016). Organisations that implement a strategic approach to leadership development are more likely to have a culture that

supports innovation and risk-taking and is able to maintain a competitive advantage over the long term (Cummings & Knott, 2018).

Perry-Smith and Mannucci (2017) suggested that innovation consists of four phases: ideation, idea development, idea championing, and idea realisation. Leaders with a strategic focus can influence each phase in unique ways, and it is therefore vital for strategic and innovative leadership to be considered as a factor of CHI adoption that can enhance process efficiencies and corporate innovation.

2.3.2 Data-driven Decision-making

Data-driven decision-making (DDDM) is an emerging technology that has the potential to improve strategic choices and increase predictability in response to uncertain environments. Organisations serious about improving their decision-making process are increasingly prioritising DDDM as one of the many opportunities afforded by rapidly developing technologies (Bertsimas & Kallus, 2020; Raisch & Krakowski, 2020; Ghasemaghaei, Ebrahimi & Hassanein, 2018). They usually start their digital transformation journey by defining a clear enterprise data strategy to address key challenges and encourage strategic objectives (Wamba, 2017).

DDDM refers to the process of enhancing human decision-making capabilities using algorithm-based systems (Kordzadeh & Ghasemaghaei, 2021) and is particularly useful in highly complex domains characterised by uncertainty and ambiguity as it improves the decision-making process by removing human biases (Kordzadeh & Ghasemaghaei, 2022). While the application of DDDM to real-world problems still faces significant challenges (Ghasemaghaei, Ebrahimi, & Hassanein, 2018), there is no doubt that this technology holds great potential for driving strategic innovation and increasing predictability across industries and contributing to the success of companies looking to gain a competitive edge in an increasingly volatile business environment (Choudhury, Starr & Agarwal, 2020; Lindebaum, Vesa & Den Hond, 2020).

The success of DDDM depends on the availability of relevant and meaningful data and the quality of algorithms used to process the data collected. Inaccurate or incomplete

datasets can result in biased or unreliable results and reduce the value of DDDM. Trust in data, which influences DDDM's rational mode of reasoning, has been the subject of numerous studies (Glikson & Woolley, 2020; Surbakti, Wang, Indulska & Sadiq, 2020). Various factors, such as the quality and timeliness of data, as well as the reliability and transparency of the data provider, have been identified as crucial determinants of trust in data (Surbakti, Wang, Indulska & Sadiq, 2020). Companies that lack accurate data on the state of their affairs have no place to start charting a new course (Jesse, 2018). Therefore, organisations must develop efficient strategies to ensure that the data are comprehensive, accurate and up to date while also providing sufficient context for the data to avoid misleading inferences.

Additionally, big data and machine learning hold significant potential for the improvement of DDDM by providing new insights. However, big data alone cannot guarantee the realisation of competitive advantage. It is essential to integrate data with analytics and create solid organisational processes around these capabilities to achieve long-term success. Furthermore, useful exploitation can be affected by various factors such as data availability, quality, expertise, technology, culture and heterogeneity (Gupta & George, 2016; Troisi, Grimaldi, Loia, & Maione, 2018) or the decision-maker's analytical skills and perception of the data (Chen, Preston, & Swink, 2015).

The supportive roles of algorithm-based systems have been highlighted in prior research on managerial decision-making, which suggests that human reasoning still affects a final decision (Raisch & Krakowski, 2020). Therefore, it is vital for organisations to develop the right internal environment for data-driven decision-making and ensure support for the development of new initiatives aimed at maximising the benefits of analytics.

2.4 TECHNOLOGY

2.4.1 Technological Advancements

The notion of 4IR was initially introduced in 2011 (Lu, 2017), referring to the homogenisation of people, intelligent technologies, physical objects, and processes across organisational spheres, intended to form a system in which all processes are merged, and information is shared in real-time (Agostini & Filippini, 2019). The primary

digital principles of IR4 comprise interoperability, decentralised systems, service orientation and real-time capabilities (Ghobakhloo, 2018) that enable organisations to create intelligent networks with autonomous control over each other along the entire value chain (Agostini & Filippini, 2019). When augmenting these principles with innovative technologies, they can improve the effectiveness of organisational operations by focusing on business models, processes, and products (Tortorella & Fettermann, 2017). Additionally, studies found that AI implementation in organisations effectively enhances productivity, improves the quality of decision-making and reduces decision-making time (Duan, Edwards & Dwivedi, 2019; Dwivedi et al., 2021).

Innovative technologies include concepts such as the cloud processing, AI, advanced analytics, cyber-physical systems, IoT and Big data (Fatorachian & Kazemi, 2018; Agostini & Filippini, 2019; Ghobakhloo, 2020; Oztemel & Gursev, 2020, Kazancoglu & Ozkan-Ozen, 2018). Machine-learning-based systems could actively participate in problem-solving and facilitate collaboration processes (seeber t al., 2020), while it is anticipated that Smart Personal Assistants will increase employee productivity by adapting their tasks and working routines (Knote, Janson, Söllner & Leimeister, 2020)

It brings relatively new concepts and technologies (Jiang, Kleer, and Piller, 2017) and creates a level of uncertainty about the impact it will indeed have on organisations (Qin, Liu, & Grosvenor, 2016). Scholars and practitioners are investigating effective means to accommodate the adoption of AI concepts and technologies into existing organisational designs (Sanders et al., 2017). However, the best way in which advanced technologies are merged into current systems and organisational contexts is an ongoing topic of research (Tortorella & Fettermann, 2017). Dwivedi et al. (2021) highlight the importance of a clear AI adoption strategy in organisations to avoid failure in critical business areas, address workforce concerns and provide strategic success measurements.

Existing literature has extensively emphasised the benefits of AI technologies, including the ability to resolve ongoing organisational issues such as real-time decision-making (Oztemel & Gursev, 2018) or real-time tracking of demand uncertainty (Szalavetz, 2019). Furthermore, research shows that these technologies can improve operational efficiency, responsiveness, and cost, increasing the organisation's long-term sustainability (Chauhan, Singh & Luthra, 2021). Some studies signify that AI adoption exposes organisations to increased workforce training requirements, change management and the

expiration of their current business models (Chauhan et al., 2021). These arguments contributed to the debate around the real benefits of innovative and connected technologies to firms (Tortorella & Fettermann, 2017) and have consequently left several firms in a dilemma regarding the adoption of advanced technologies (Odoom & Mensah, 2019).

2.4.2 Technological Displacement

In the past few decades, technological change has been widely discussed as a potential source of widespread concern. For instance, concerns have been raised about the potential of digital technologies such as robotics and AI to displace people from their jobs and affect their livelihoods (McGuinness, Pouliakas & Redmond, 2021). Frey and Osborne (2017) point out that nearly half of all roles in developed economies are susceptible to technological displacement. Conversely, recent estimates indicate a significantly lower likelihood of role replacement (Arntz, Gregory & Zierahn, 2017).

Although the extent to which digital technologies have already displaced people from their workplace has not yet been quantified (Freeman, Ganguli & Handel, 2020), technological developments pose numerous challenges for people and organisations that need to be carefully considered. There are two main concerns that need to be addressed in order to minimise the impact of technological displacement. First, it is essential for organisations to understand the impacts that technology will have on their employees' current jobs as well as their roles within the organisation (McGuinness, Pouliakas & Redmond, 2021). Second, employees must be equipped with the necessary skills and expertise to adapt to the new work environment (Davenport & Mahidhar, 2018). This will ensure that the organisation remains competitive in an ever-changing digital landscape while ensuring its employees are well-prepared for the future.

2.5 COLLECTIVE HYBRID INTELLIGENCE

The term CHI refers to the symbiosis between human workers and AI technologies, augmenting their strengths to increase the efficiency of job execution. It is built on the idea that humans and computers have complementary capabilities and strengths that can be combined to supplement each other and improve their combined abilities and efficiencies (Dellermann et al., 2019). Jarrahi (2018) argues that the intention of AI systems should be to improve human abilities rather than substitute them, while Bibby and

Dehe (2018) raise the social concern that AI innovation might soon replace human tasks and decision-makers. In contrast, attention is returned to AI's lack of reasoning, creativity and ability to show genuine empathy, which suggests that AI will need some form of human interaction for the foreseeable future (Guszcza, Lewis & Evans-Greenwood, 2017).

Machine-learning capabilities are already utilised to actively participate in problem-solving and facilitate collaboration among teams (Seeber et al., 2020). Research into the evolution of human-computer interaction indicates the possibilities of AI-based personal assistants augmenting employee capabilities (Knote, Janson, Söllner, & Leimeister, 2020).

It is an unquestionable fact that computers are better able to perform laborious computations or detect patterns in big data than their human counterparts (Frey, & Osborne, 2017). However, humans still maintain their comparative advantage when dealing with ambiguity and creativity due to their significant intuition to deal with vagueness and uncertainty (Jarrahi, 2018). These differences in strength demonstrate how human workers and AI leverage each other's strengths to create a symbiosis between humans and computers. Effective implementation of AI in CHI can improve human employees' efficiency while freeing up their time to focus on innovation, creativity and renewal of skills and competencies (Wilson & Daugherty, 2018). To compensate for the limitations of AI, collective hybrid intelligence systems can offload complex tasks to humans when required. Human intelligence can augment the AI to prevent possible failures or biased decisions potentially caused by an AI system on its own. Additionally, the human response can be exploited to create a virtuous improvement cycle teaching the AI how to act (Ostheimer, Chowdhury & Iqbal, 2021).

Going forward, the main challenge is beyond AI, towards the competitive struggle between humans and machines for knowledge-intensive jobs in fields such as analysis, algorithm design, computing, and self-learning (Ghobakhloo, 2020). The question concerns the best imaginable cooperation between Human Intelligence (HI) and AI (Liboni, Cezarino, Jabbour, Oliveira, & Stefanelli, 2019).

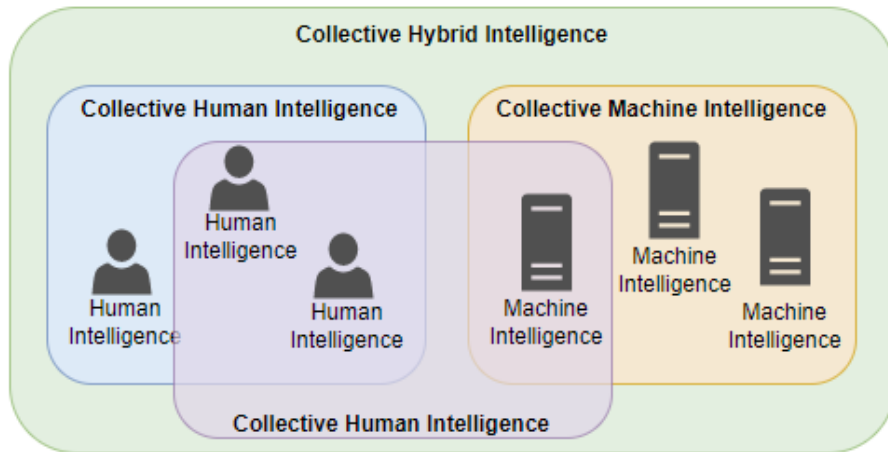


Figure 1 - Concepts related to Collective Hybrid Intelligence

2.5.1 Human Intelligence

Human intelligence is unquestionably one of humanity's most impressive and defining aspects. It defines the mental capabilities of human beings and allows them to adapt to changing environments, act towards achieving their goals, and learn new skills. Human intelligence is often defined as the ability to accomplish complex goals, learn, reason, and adaptively perform effective actions within an environment based on previously gained knowledge (Cowan, 2015). However, human intelligence is significantly more complex and can cover a wide range of skills and abilities, subdivided into three distinct dimensions of intelligence: experiential, componential, and contextual (Gardner, 2000; Sternberg, 1985). Experiential intelligence refers to a human being's ability to learn and adapt through past experiences, while the componential intelligence dimension defines a broad set of skills that a human being consists of. Contextual intelligence defines the human capacity to inductively recognize and take action in particular situations and includes the ability to modify the context in which choices are made.

Within the scientific community, there are disagreements about the exact definition of intelligence and the definition of intelligence measurement. Newel (1994) defines intelligence as "the ability to connect two independent systems: that for knowledge acquisition and the system for action". This definition states that individuals should be able to acquire and apply knowledge and use their cognitive skills to effectively carry out their plans and actions to achieve their desired goals. Additionally, Sternberg (1986) defined intelligence as consisting of different abilities that work together to produce higher

levels of cognition and performance. Therefore, individual differences in intelligence may be explained by a combination of an individual's cognitive abilities and task demands.

2.5.2 Artificial Intelligence

Artificial intelligence (AI) is a subfield of computer science that deals with creating and studying intelligent machines. It deals with the question of how machines capable of intelligent behaviour can be created, particularly in the areas of reasoning, knowledge, planning, learning, perception, and speech (Jarrahi, 2019). AI is considered by organisations around the globe as the frontier for digital transformation and a significant disruptive technological innovation with the potential to unleash the next machine age (Brynjolfsson and McAfee, 2017).

Unlike traditional computer programming, which involves following precise instructions written by a human programmer, AI attempts to build programs that can learn for themselves based on trial and error, pattern recognition, or by utilising existing datasets. There are numerous forms of AI, however the most popular forms are Machine Learning and Deep Learning. Recent advancements in deep learning have significantly improved the ability of algorithms to simulate human abilities such as image recognition, natural language processing and analytical processing. (Jarrahi, Askay, Eshraghi & Smith, 2022). Combined with increased computational power and a copious amount of data, these AI tools are increasingly being utilised for commercial purposes (Canhoto & Clear, 2020; Kaplan & Haenlein, 2019).

Artificial intelligence aims to emulate the cognitive functions of human minds. The ultimate goal of this technology is to create a machine that functions in a way that is similar to the human mind and performs basic human tasks (Jarrahi, 2018). For this reason, a common fear exists that AI, with its unprecedented capacity to automate intelligence, will displace copious amounts of human employees as its abilities start to outperform humans in an increasing number of task domains (Jarrahi, 2019; Dehe, 2018). However, AI's lack of reasoning, creativity and ability to show empathy leaves a gap to be filled by human intelligence (Guszcza, Lewis & Evans-Greenwood, 2017).

2.6 CHANGE MANAGEMENT

Change management is defined as a planned and systematic process that ensures the continuous alignment of an organisation's culture, structures, and processes with its strategic goals (Moran & Brightman, 2001). Therefore, organisations planning a significant transformation will likely require a formal change management process to implement the changes effectively. The primary purpose of change management is to identify the need for change within the organisation before establishing the most effective way to implement the change to achieve the desired outcomes (Rosenbaum, More & Steane, 2018).

Several change managements models and theories have been defined in literature over the last decade, with the most popular including Lewin's (1947) Three step model, Kotter's (1996) Eight-step model and Mckinsey's 7-S model (Peters & Waterman, 1982). They all have certain similarities but substantial differences in others. Kotter emphasises the importance of leadership in bringing about change, whereas Lewin investigates the variables that support and discourage it, and McKinsey stresses that change agents consider both the business and human aspects of the transformation (Lewin, 1947; Kotter, 1996; Peters & Waterman, 1982). Even though the relationship between McKinsey's 7S and Lewin is less clear when considering the elements, recognising the necessity to comprehend the current state before progressing to the following positions is compatible with the refreezing and moving strategy (Rosenbaum, More & Steane, 2018).

Countless elements can impact the effects of CHI on large enterprises and are essential for the appreciation of the concept. However, in this study, only the "hard" and "soft" factors pertaining to Mckinsey's 7S change management model were considered. The primary strength of the M7S framework is its ability to illustrate the interdependencies between the elements and their combined effects on organisational efficiencies (CFI, 2022). Key applications of the framework in organisations include the facilitation of effective change, supporting management decision-making during strategic implementation, and change management, which makes it ideal for this study.

2.6.1 McKinsey 7S Model

McKinsey's 7S (M7S) model, developed by Waterman, Peters and Phillips (1980), presents a resource-based view of an organisation's strategic assets, focusing specifically on seven elements, including Shared Values, Strategy, Structure, Systems, Style, Staff

and Skills (Waterman et al., 1980). The model was developed to analyse the critical factors in organisational design that contribute to achieving its strategic change objectives (Cox, Pinfield & Rutter, 2018). Since its proposal, the model evolved to become an essential approach to scrutinising strategic change in organisations (Hayes, 2022; Waterman et al., 1980).

The model's first three elements, strategy, structure, and systems, are viewed as the “hard” factors. They are measurable, concrete, and easier for management to control. The remaining four elements: style, staff, skills, and shared values, are regarded as “soft” factors as they are intangible and tricky to manage directly. The power of the model is the significance it assigns to the alignment of the factors underlying organisational performance. Fundamentally the model points out that effective strategy is greater than individual aspects such as organisational change or strategy. It is the relationship between (the soft factors) systems, structure and strategy united with (the hard factors) shared values, staff, style and skills.

The M7S model enables the different areas in a company to act coherently. It allows efficient tracking of change impact on key factors and is considered a mature theory. However, it is highly time-consuming, focuses mainly on internal factors and requires significant support from senior management, who may not have the capacity to assist (CFI, 2022). The elements in the model are all interlinked, making it cumbersome to change one area without keeping the other areas aligned.

2.6.2 Hard factors

The model's first three elements, which include strategy, structure and systems, are viewed as the "hard" factors. They are measurable, concrete and easier for management to manipulate and control.

2.6.2.1 Strategy

Strategy is the plan the organisation produces to maintain its competitive advantage. It is how organisations endeavour to win (Eisenhardt & Bingham, 2017). Several case studies demonstrate that a company's competitive position is enhanced primarily by the strategies employed by its executives and only secondarily by the technologies it employs. (Ismail et al., 2017). Furthermore, to successfully plan and implement technological innovation, organisations must have a well-defined strategy and place innovation at the heart of their operations. (Gill & Vanboskirk, 2016).

Research shows significant value in a hybrid strategy where human and computer capabilities are merged to augment each other (Jarrahi, 2018). There is an ongoing competition between humans and machines for knowledge-intensive jobs (Ghobakhloo, 2020). However, an effective AI implementation strategy can free up time for human employees to focus on innovation, creativity and value-added analysis at which humans are better than AI technologies (Wilson & Daugherty, 2018). Although there are numerous different strategies for CHI adoption, the question remains what the best possible strategy is for cooperation between humans and computers in large enterprises (Liboni et al., 2019)?

Corporate innovation and process efficiencies are the overarching concepts that involve several competitive strategies organisations can employ if they want to achieve significant operational performance advancements. Therefore, strategy, rather than technology, is regarded as the fundamental driver of innovation and process efficiencies.

2.6.2.2 Structure

All enterprises are multi-element entities and must have a defined structure to function efficiently. This organisational structure is mostly represented on the organisational charts (Waterman et al., 1980; CFI, 2022). In the M7S model, the structure is considered to be critical but also challenging when focussing on the factors that are vital for the progress of the organisation (Channon & Caldart, 2015).

Studies are almost unanimous in the notion that AI will reduce the human workforce as we know it, but research shows that the changes in technologies are creating new opportunities in organisational structures (WEF, 2020). New ways of working encouraged by a combination of IR4 technologies and COVID-19-induced lockdowns required organisations to rethink their structures. More focus is placed on human resources for reskilling and upskilling employees (van Hoek et al., 2020) and Information Technology for cybersecurity and big data analytics (Agostini & Filippini, 2019). New roles in top management, including Chief Digital Officer, Chief Analytics Officer and Chief Artificial Intelligence Officer, are required to bridge the gap between business and information technology and encourage advances in HCI (Ramrathan & Sibanda, 2017). Leaders are encouraged to think broadly and to consider the implications of major changes in technology on organisations. While new technology and skills are definitely required, it is

equally important to align an organisation's style, structure and culture to support AI adoption.

Even though extensive literature exists on the effects of adopting innovative AI technologies in large enterprises, it focuses on the impacts on competencies and neglects its effects on organisational structures (Cimini, Boffelli, Lagorio, Kalchschmidt & Pinto, 2020). Furthermore, no clear definition of an efficient organisational structure exists for effective CHI adoption that could enhance corporate innovation and process efficiencies

2.6.2.3 Systems

Systems are defined in the M7S model as the formal and informal activities that form part of an organisation's daily operations (Waterman et al., 1980; CFI, 2022). The adoption of AI technologies linked to the acceleration of innovation triggers systematic changes in numerous organisational areas. Changes are evident in day-to-day employee activities, which relate to AI technology adoption. As previously discussed in section 2.4, lower-skilled jobs are being automated, and employees are upskilled to perform new tasks (Brougham & Haar, 2018). Researchers argue that humans and AI can work in symbiosis to augment each other's strengths (Jarrahi, 2018) and that the development, maintenance and management of AI procedures and rules will become systematic daily functions of organisations (Guszcza et al., 2017).

There is agreement amongst academics and practitioners that organisational systems are changing. However, more research is needed on how these systematic changes affect the other elements of M7S and what the optimal mix of human-computer collaboration is for CHI adoption to enhance corporate innovation and process efficiencies.

2.6.2.4 Soft Factors

The "soft" elements of the M7S model include style, staff, skills and shared values. They are regarded as "soft" factors due to the fact that they are intangible and tricky to manage directly.

2.6.2.5 Style

The style element of M7S refers to the company leadership's management style and includes their interactions, behaviours and actions (Waterman et al., 1980; CFI, 2022).

This element is key in the process of identifying difficulties in management and change-management processes, which is key to this study (Channon & Caldart, 2015).

Most organisations struggle and face several management challenges in the process of transitioning to CHI and, in some cases, are hesitant to adopt innovative technologies (Oliveira & Stefanelli, 2019). The large-scale availability of information creates an expectation for leaders to encourage data-driven decision-making and fact-based strategic leadership (Kolbjørnsrud, Amico & Thomas, 2017). An in-depth discussion of these two factors can be found in section 2.3.

Leaders are expected to be open-minded to the notion of co-designing technological investment with managers from other areas (Cimini, Boffelli, Lagorio, Kalchschmidt & Pinto, 2020). They require patience and a long-term perspective to see the true value of CHI and not give in to the pressures to show short-term return on investment through headcount reduction as an effect of AI implementation (Jarrahi, 2018).

Literature on management styles for the effective adoption of CHI and its impact on corporate innovation and process efficiencies is limited (Pillay, Yadav, Sivathanu, Kaushik, Goel, 2021) and necessitates additional research on the topic.

2.6.2.6 Staff

An organisation's staff, or human resources, is its most valuable strategic asset and is considered the core of every organisation (Channon & Caldart, 2015). The M7S framework places a strong emphasis on this element and considers staff as a pool of resources which needs to be nurtured, developed and defended.

The advent of IR4 supports the incorporation of evolving technologies to add value to the organisational life-cycle but consequently requires a sociotechnical evolution of the role of human employees in the organisation (Frank, Dalenogare & Ayala, 2019). While the advancements in the technology field have created excitement, a level of anxiety remains among employees around the potential redundancy of jobs (WEF, 2020).

There are widespread concerns that technological development, in the form of digital technology such as RPA and AI, will displace workers and negatively impact their livelihood (McGuinness, Pouliakas & Redmond, 2021; Fountaine, McCarthy & Saleh,

2019; Ng, 2016). Bibby and Dehe (2018) concur and raise a social concern that AI innovation might soon replace human tasks and decision-makers, but Guszczka et al. (2017) challenge the concern and argues that AI will always need some form of human interaction. This tension will intensify as AI capabilities advance from administrative labour automation to advising roles that aid with problem-solving and decision-making (Kolbjørnsrud, Amico & Thomas, 2017).

Some experts believe that AI will likely cause redundancy in lower-skilled jobs but will, at the same time, cause countless new opportunities to be created (Brougham & Haar, 2018; Frey & Osborne, 2017). Conversely, recent research indicated that skills-displacing technology primarily affects higher-skilled workers, increasing disparities in workplace upskilling possibilities (McGuinness, Pouliakas & Redmond, 2021). Furthermore, it is suggested that AI will augment the work of humans to create a collaborative human-computer workforce (Jarrahi, 2018). New roles, new technologies, and collaborative processes create a substantial need for upskilling and reskilling of workers (Frank, Dalenogare & Ayala, 2019). The combination of environmental changes, continuous upskilling and reskilling and the fear of technological displacement increases employees' resistance and can indicate problems for all those involved in the implementation (Fountaine, McCarthy & Saleh, 2019; Kolbjørnsrud, Amico & Thomas, 2017).

It is, therefore, vital that employees understand the importance of change initiatives and the benefits that it holds for them. Leaders must articulate a vision that unites everyone around a common objective. Employees need training on the value of AI to the company and how they can best contribute to the emerging AI-centric culture. They need confidence that AI will enhance their positions rather than replace them (Fountaine, McCarthy & Saleh, 2019). Including employees during the early stages of the implementation process make them accustomed to the change and therefore eases the transition to change management (Gupta, Kumar, Singh, Foroapon, & Chandra, 2018). This sentiment is shared by Mansouri, Singh and Khan (2018), who argued that the structure, culture, leadership style, and citizenship behaviour of the organisation define the design of its knowledge management and knowledge sharing.

A deeper understanding is therefore needed of the role of human intelligence in the CHI model and how the symbiosis between humans and AI can enhance corporate innovation and process efficiencies in large organisations.

2.6.2.7 Skills

The skills element of M7S refers to the set of skills and capabilities of an organisation's employees. A combination of AI technologies, the COVID-19 pandemic-induced lockdown and the economic recession has contributed significantly to the organisational need to find new ways of work (WEF, 2020). As technologies provide opportunities for both society and the economy, mismatches in required skills between employers and employees will continue to be an issue for the future of work as a result of continued advancements in AI technologies (Frey & Osborne, 2017). Continued technology advancements will therefore not only reduce the need for personnel but also require businesses to restructure and reorganise their work procedures (Sonya & Naik, 2020).

Technological advances have a systemic impact on all aspects of business operations, necessitating the sociotechnical evolution of the human role in business. (Bleicher & Stanley, 2019). The skill count required per job has increased annually by 10% since 2017 due to continuous technological innovation (Gupta, 2021) with an increasing requirement for constant skill renewing and the augmentation of jobs with AI capabilities (Chauhan et al., 2021, WEF, 2020). Although the impact of technological advancement on skill relevance varies significantly across occupations (Deming & Noray, 2020), a substantial number of organisational employees will require extensive upskilling and reskilling (Frank, Dalenogare & Ayala, 2019).

Kamble, Gunasekaran and Sharma (2018) stated that the skills of the workforce in IR4 will become vital for success in a highly innovative environment. If the workforce lacks the requisite knowledge, skills, and habits for the effective adoption, implementation, and maintenance of AI technologies, the benefits of innovative progress will be limited (Frank, Dalenogare & Ayala, 2019). A strong foundation of soft skills from the human worker, such as critical thinking, collaboration, leadership, innovation and emotional intelligence, is required for an efficient CHI environment within organisations (Wilson & Daugherty, 2018). Furthermore, emphasis is being placed on continuous improvement of the hard and soft skills of data architects, data engineers, data scientists and any employees responsible for AI solution development, data governance and data analytics (Fountaine, McCarthy & Saleh, 2019). Not only will this result in staff with better data and technology skills, but upskilling will also give them the ability to frame business problems in a way that allows

them to determine which innovative processes or technologies are most appropriate to address them (Davenport & Mahidhar, 2018).

Without the proper application of technology, a company's performance, productivity, and competitiveness will decline substantially. It is the skills of the labour force that generate the scientific knowledge upon which development is built and that enable the adoption and application of innovative technologies in various business sectors in order to increase productivity and sustain competitive advantage (Danquah & Amankwah-Amoah, 2017). The skill mix, capabilities, attitudes, experiences, and knowledge of the workforce are, therefore, inextricably tied to technology and human capital levels, such as creativity, knowledge, and ingenuity. Innovation and technology can be utilised more efficiently when the workforce develops new skills (Adusei, 2016).

To establish a workforce suited for the adoption of CHI, it is vital to recruit and develop new talent in addition to existing reskilling personnel through training programmes to reduce the skills gap between employers and employees. If the future of work implies constant transformation, triggering a requirement for lifelong learning, then the emphasis on talent management becomes increasingly important in the research of CHI adoption and its effects on corporate innovation and process efficiencies (van Hoek et al., 2020). Researchers have found that training and knowledge management at the corporate level significantly impact an organisation's innovative performance (Hendarman & Cantner, 2018).

2.6.2.8 Shared Values

Shared values are core to the organisational culture. It signifies the organisation's goals, beliefs, norms and standards and can affect its reputation (Waterman et al., 1980; CFI, 2022). It is the core beliefs of an organization that are widely shared across the organization and are often the reason for its existence. Shared values reinforce the culture of an organization and help promote its overall wellbeing. It is important that the values shared by the organization coincide with the principles of management and the development goals of an organisation. It is the collective set of behaviours that govern the work environment and determine the way employees perform their job. Since different generations and departments have different values and beliefs, it is important to encourage cooperation between different groups in order to promote synergy within the organization (CFI, 2022).

According to Jarrahi (2018), the benefits of CHI will likely only materialise after a long-term symbiotic relationship. However, leaders often opt to justify the return on investment with significant headcount reduction sacrificing organisational talent and often demoralising the workforce (Davenport & Faccioli, 2017). Studies of prior technology initiatives indicate that immediate financial gains through lay-offs can be short-lived and disillusioned by more profound effects such as reputational damage or workforce demoralisation (Jarrahi, 2018). The culture or norms of an organisation should not cause reputational damage or demoralise its workforce and therefore it is vital to study the impact of CHI on the shared values of an organisation as well as its ability to enhance corporate innovation and process efficiencies.

2.7 CONCLUSION

The basic digital principles of IR4 enable organisations to create intelligent networks with autonomous control over each other along the value chain (Agostini & Filippini, 2019). These principles, combined with AI technologies, hold the potential to improve process efficiencies within organisational operations by focusing on business models, processes and products (Tortorella & Fettermann, 2017). Additionally, organisations are investigating effective means to accommodate the adoption of AI concepts and technologies into existing organisational designs (Sanders et al., 2017), which will enable a symbiotic partnership between humans and computers, improving the efficiency of human workers by freeing up critical human time and allowing them to focus on intuitive and innovative tasks (Wilson & Daugherty, 2018).

As indicated in the literature, numerous elements can have an impact on effective CHI adoption and its effects on corporate innovation and process efficiencies. Mckinsey's 7S model provides a framework to analyse the factors of organisational design that contribute to the achievement of its strategic change objectives (Cox et al., 2018) and will therefore be used in this study as a framework to test the effects of CHI on organisations and how the adoption of CHI can enhance corporate innovation and process efficiencies.

CHAPTER 3 - RESEARCH QUESTIONS

3.1 INTRODUCTION

Following the discussion of the current literature in chapter two, chapter three outlines the study's research questions in light of the presented literature. Chapter three formulates two research questions which were devised through careful consideration of the research problem and guidance from the existing literature presented in chapter two. The purpose of the research questions is to gain insights into the factors of collective hybrid intelligence (CHI) adoption that would enhance corporate innovation and process efficiencies.

3.2 RESEARCH QUESTION ONE

What are the key factors of adopting CHI principles that may enhance corporate innovation in large enterprises.

AI and Machine-learning capabilities are already utilised to actively participate in problem-solving and facilitate collaboration among teams (Seeber et al., 2020), with research into the evolution of human-computer interaction indicating the possibilities of AI-based personal assistants augmenting employee capabilities (Knote, Janson, Söllner, & Leimeister, 2020). It is an unquestionable fact that computers are better able to perform laborious computations or detect patterns in big data than their human counterparts (Frey, & Osborne, 2017). Furthermore, effective implementation of AI in CHI can improve the efficiency of human employees while also freeing up their time to focus on innovation, creativity and renewal of skills and competencies (Wilson & Daugherty, 2018). Therefore it is vital for organisations to be innovative and adopt AI technologies to remain relevant in a highly competitive business environment.

Research question one seeks to establish the critical factors related to the adoption of CHI principles that may encourage and improve innovation in large enterprises. The question will be analysed in two parts by using the “hard” and “soft” factors of McKinsey’s 7S model for organisational change management (Waterman et al., 1980).

3.3 RESEARCH QUESTION TWO

What are the key factors of adopting CHI principles that may enhance process efficiencies within large enterprises.

The term CHI refers to the symbiosis between human workers and AI technologies, augmenting their strengths to increase the efficiency of job execution. It is built on the idea that humans and computers have complementary capabilities and strengths that can be combined to supplement each other and improve their combined abilities and efficiencies (Dellermann et al., 2019).

Research question two seeks to establish the critical factors related to the adoption of CHI principles that may enhance process efficiencies in large enterprises. Enhanced process efficiencies can lead to a greater competitive advantage for a company over its competitors. The question will be analysed in two parts by using the “hard” and “soft” factors of McKinsey’s 7S model for organisational change management (Waterman et al., 1980).

3.4 CONCLUSION

Chapter three presents the research questions that this study intends to address. As stated in the research problem, in the midst of the fourth industrial revolution, large-scale technological innovation necessitates significant changes to the business environment. Large enterprises are rapidly adopting AI technologies and finding improved ways of working (Pillai et al., 2021) and are reconsidering human and AI capabilities to ultimately establish an environment where human-computer collaboration is efficient and sustainable (Jarrahi, 2018). By gaining a deeper understanding of the areas expressed in the research questions, this study aims to identify new factors of human-computer collaboration that can enhance corporate innovation and increase process efficiencies within large organisations.

CHAPTER 4 - RESEARCH METHODOLOGY AND DESIGN

4.1 RESEARCH QUESTION

Two research questions were devised through careful consideration of the research problem and guidance from existing literature. The purpose of the research questions was to gain insights into the factors of collective hybrid intelligence (CHI) adoption that might enhance corporate innovation and process efficiencies.

RQ 1: What are the key factors of adopting CHI principles that may enhance corporate innovation within large enterprises.

RQ 2: What are the key factors of adopting CHI principles that may enhance process efficiencies within large enterprises.

4.2 CHOICE OF RESEARCH DESIGN

4.2.1 Purpose of research design

This study aims to add to the existing body of knowledge by taking advantage of exploratory qualitative research in the form of semi-structured interviews to discover additional information on the topic. Semi-structured interviews will be conducted with senior executives of large enterprises, after which they will be transcribed and analysed in an attempt to create a theory and answer the research question. The research aims not to describe events, objects or situations, nor will it attempt to find explanations behind specific occurrences. It will explore additional information on the factors of CHI adoption that enhance corporate innovation and process efficiencies, which embraces the motive behind the selected research design.

Saunders & Lewis (2018) define exploratory research as a technique used to discover new information on a topic that the researcher might not clearly understand. Therefore, the exploratory qualitative technique is the appropriate technique to gain new insights into the factors related to the adoption of CHI principles that may enhance corporate innovation and process efficiencies.

4.2.2 Philosophy

In the process of developing knowledge on the selected topic, a critical philosophical approach will be followed. Saunders and Lewis (2018) states that the interpretivist perspective is pertinent for research on organisations and management, particularly when it comes to organisational behaviour and human resource management. For this reason the interpretivism philosophy will be adopted to better understand unique and complex interaction between the organisation, its employees and AI technologies. The focus will be placed on efficient adoption of CHI principles during literature reviews and semi-structured interviews to ensure the discovery of measurable facts to produce meaningful and credible data. Individual studies conducted on the topic of CHI principles in recent years will be utilised to gain a deeper understanding of the context of the topic before conducting interviews.

4.2.3 Approach selected

The proposed research seeks to utilise the existing body of knowledge to identify the existing factors and build a theory before gathering additional data through semi-structured interviews to test the theory. The focus will be on identifying patterns in the feedback gathered from the semi-structured interviews and comparing it to existing literature to form a conclusion. The induction approach will be followed and explained by Saunders and Lewis (2018) as a research approach involving building a theory from already collected data and is therefore a suited approach for this study.

4.2.4 Methodological choices

The research question and research design proposed for this study require semi-structured interviews to be conducted, which will result in qualitative data. Qualitative data consists of non-numerical data, including text material, like interview transcriptions and articles, or non-text material like recordings, images, or videos. (Saunders & Lewis, 2018). The non-experimental, exploratory design of the study makes it infeasible for a quantitative methodological approach.

4.2.5 Strategy

Saunders and Lewis (2018) explain case studies to be particularly useful at enabling researchers to understand the context of the topic as well as the activities taking place within the context. In this study, “CHI principles” would be the context and “corporate innovation” and “process efficiencies” would be the activities taking place within the

context. Case studies allow the use of semi-structured interviews as a data capturing technique (Saunders & Lewis, 2018) and this reason the case study strategy, which is commonly utilised in exploratory research, will be applied.

4.2.6 Time horizon

Even though the research will take advantage of literature from prior studies, the focus will remain on the current factors. Data will be collected from participants at a single time period and will not form a timeline to track changes. Cross-sectional research designs are utilised when researchers collect snapshots of data at only a single period and would therefore be the best suited time horizon for this study (Saunders & Lewis, 2018).

4.3 PROPOSED RESEARCH METHODOLOGY

4.3.1 Population

Population is defined by Saunders and Lewis (2012) as the members of a group or cases from which a sample can be obtained. The research population will be limited to large enterprises within the South African financial and insurance industry and will target senior executives and subject matter experts with relevant experience. The end-to-end understanding of the organisation and its transformation strategies by executives and the expertise of the subject matter experts make them the best-suited participants for this study. Contact will be made with executives and experts through industry networking events and professional networking platforms.

4.3.2 Unit of analysis

The study aims to describe factors of CHI adoption that enhance corporate innovation and process efficiencies through the responses of the sample population. Since the unit of analysis is defined by Vogt and Johnson (2015) as the person or thing being studied, it would include the individual executives, managers and experts in the sample of this study.

4.3.3 Sampling method and size

Time constraints and the practicality of collecting data from the entire target population are among the reasons why researchers opt to collect data from a subset or sample of the target population rather than the entire population (Saunders & Lewis, 2018). A relatively small number of senior executives and subject matter experts will be interviewed to gather information on the topic. A homogeneous purposive sampling method will be adopted for

the qualitative study, with a sample size of 12 to 18 interviews with executives, managers and subject matter experts from large financial and insurance. Interview numbers are dependent on the stage at which saturation will be reached. The proposed sample size aligns with the proposed case research design (Onwuegbuzie & Collins, 2007).

4.3.4 Measurement Instrument

During the research, theoretical assumptions are deemed invalid until proven otherwise, which is the reason for data collection and analysis. Semi-structured interviews will be formatted to start with informal discussions to gather demographic information before providing context and moving on to the formal data gathering process. Questions will be formulated and ordered to gather demographic information as well as feedback grouped into the soft and hard sections of the McKinsey 7s model (Channon & Caldart, 2015). The order and format of questions can change during the interview as new topics arise.

Interview layout, transcription, and data capturing processes will be piloted with the researcher's personal contacts before research interviews are conducted. Saunders & Lewis (2018) noted the importance of a pilot test to avoid questions being misunderstood or questions that lead the participant. Interviews will be conducted virtually on Microsoft Teams or Zoom, which has automated transcription options that can help reduce transcription editing times. In cases where the automated transcription quality is low, tools like Otter.ai will be taken advantage of to prepare new transcriptions from the recordings. Transcriptions will be loaded onto Atlas.ti to be coded and analysed.

4.3.5 Data gathering process

Semi-structured interviews will be conducted to gather primary data from the sample population. As suggested by Creswell and Poth (2016), formal consent for the interviews will be obtained from participants before the interview is scheduled. All interviews will be conducted remotely to take advantage of the automated transcription and recording functions provided by Microsoft Teams and Zoom. The interview process will aim to gain additional knowledge on the factors of CHI that may enhance corporate innovation and process efficiencies in large enterprises to identify recurring factors from interviews that can potentially be used in data triangulation. In semi-structured interviews, the order and format of the questions may vary between interviews based on the participant's responses (Saunders & Lewis, 2018).

Time budgets for each semi-structured interview will include an hour to set up the interview, 30 minutes to 1 hour to conduct the interview and 4 to 8 hours to transcribe and validate the interview. All interview recordings, transcriptions and notes will be stored on a secure cloud datastore for a minimum of ten years.

4.3.6 Analysis approach

Interviews will be transcribed, analysed and themed as proposed by Saunders & Lewis (2018), allowing new suggestions or findings to form part of future interviews and to indicate when data saturation has been reached. Upon the completion of interview transcriptions, the interviews will be imported into the Atlas.ti data analysis software where they will be thematically analysed. Thematic analysis involves the analysis and identification of themes in qualitative data (Quinlan, Babin, Carr, Griffin & Zikmund, 2018). To avoid bias, transcriptions will be verified by providing the interviewees with a copy of the transcription as suggested by McGrath, Palmgren and Liljedahl (2019).

Additional categories will be added as new information becomes available. Themes will be developed based on relationships between categories and applied to develop a theory or proposition. Existing literature and themes from expert interviews will form a basis for developing testable propositions of the CHI principles that may enhance corporate innovation and process efficiencies. Since the inductive approach will be followed, new categories and propositions could arise as the interview process continues and added to the proposition list. These propositions will then be tested against coded categories to form a conclusion.

4.3.7 Quality controls

Lincoln & Guba (1985) stated that the trustworthiness of qualitative data could be broken into four sections, including credibility, transferability, dependability, and confirmability. The feedback will be triangulated against other interviews and existing literature on the topics. This strategy will, in conjunction with the other strategies mentioned below, ensure credibility, dependability and confirmability of the data retrieved from interviews.

To further ensure the credibility of the data retrieved from interviews, the quality of coding will be reviewed continuously during the analysis process. The purposive sampling method will ensure the inclusion of credible participants, improving the trustworthiness in both the credibility and transferability criteria.

During the interview and transcription process, thick descriptions will be applied to the notes and transcriptions to describe voices, emotions, gestures and possible meanings (Ponterotto, 2006). Gestures like body language might be challenging to identify and note during virtual meetings but will be added wherever applicable. To ensure the dependability of data, all emails, discussions, interview setup processes, interview notes, transcriptions, and recordings will be kept to create an audit trail.

4.3.8 Limitations

Creswell (2012) argued that it is likely for researchers with differences in population diversity to have different research outcomes. For this reason the primary limitation of this study is associated with the population who might be susceptible to selection bias which contributes to the possibility that views of the population might differ from those of a different population selection. Furthermore, the results are based on the researcher's interpretation and understanding of the participants' responses and can only be verified by triangulating the data with other participants' responses or future research papers. These interpretations will not reflect an organisational view and should not be viewed as isolated factors CHI that may enhance corporate innovation or process efficiencies.

The study sample will be limited to large insurance and financial enterprises within South Africa and would consequently exclude macroeconomic, organisational size and many other factors when considering adoption of CHI principles. The study will focus on the perspectives of the sample population on the factors of CHI principles enhance corporate innovation or process efficiencies. It will not research any additional factors outside of the scope of the chosen framework.

Lastly, shortcomings in the interviewing, data collection and coding skills of the researcher may have an effect on data collection and ultimately the quality of the results.

CHAPTER 5 - FINDINGS

4.4 INTRODUCTION

After completing the literature review, a semi-structured interview guide with questions pertinent to the study topic was developed. Participants in the study hold executive, senior management, or subject matter expert roles within the financial or insurance industries. Interviews were conducted, and data were analysed using an inductive methodology that created summarised codes via thematic analysis techniques. The codes were categorised into code groups, which were then used to inform the themes that emerged from the data analysis. The key findings are presented in relation to the research questions discussed in chapter three.

The presentation of results in this chapter is grounded on the themes that emerged during the qualitative analysis of the interviews and their relevance to the study topics. This chapter begins with a summarised description of the study's participants, followed by a detailed presentation of the findings from the qualitative analysis.

4.5 DESCRIPTION AND CONTEXT OF PARTICIPANTS

To protect the participants' identity, their names and relevant organisations are not disclosed. In addition, as the purpose of this study was to acquire management perspectives on the research issue, the organisational details of the respondents, other than their job titles, were considered immaterial. It was essential to ensure that the roles of the respondents were relevant to the study, that is, technology, consulting and decision-making roles with the typical duties associated with such roles. Furthermore, as stated before, responses were restricted to the financial and insurance sectors. Extant literature recommended at least twelve interviews for a qualitative study (Fugard & Potts, 2014; Clarke & Braun, 2013). Therefore, after reaching saturation on the eleventh interview, thirteen interviews were deemed sufficient for this study.

Thirteen semi-structured interviews were conducted with participants from the relevant industries, which ranged from technology and business experts to executives responsible for information, technology and digital transformation. The financial industry had the largest representation, with eight respondents from the banking, fintech and consulting sector, followed by the insurance industry, with five respondents from various sub-sectors, including commercial insurance, short-term insurance, and life insurance.

To ensure that the views of the respondents have significant relevance to the adoption of collective hybrid intelligence and its effects on corporate innovation and process efficiencies, the researcher carefully ensured that the majority of respondents are from large enterprises with more than 1000 employees. The sample was selected from organisations ranging in size from around 1,100 to 35,000 people in the relevant sectors.

The thirteen interviews were conducted remotely using Microsoft Teams and Zoom technologies which enabled the utilisation of the automated transcription and recording functionality provided by these technologies. Formal consent forms were sent to all respondents introducing them to the research topic and clarifying the anonymity of the interviews, as suggested by Creswell and Poth (2016). Before each interview was recorded, the researcher reiterated to participants that their identities and those of their respective organisations would remain confidential.

Participant No.	Industry	Position and relevant experience	Number of employees	Interview length (min)
1	Short Term Insurance	Senior Business Architect	2500	36
2	Financial (Banking)	Deputy Chief Digital Officer	11700	59
3	Financial (Fintech)	Chief Information Officer	2650	37
4	Commercial Insurance	Senior Development Manager	1100	32
5	Financial (Banking)	Chief Enterprise Architect	11700	34
6	Commercial Insurance	Systems Analyst (Technology Expert)	1100	38
7	Financial (Banking)	Chief Digital Officer Former Chief Information Officer	4000	41
8	Financial (Banking)	Head of Application Portfolio Former banking Chief Technology Officer	3800	58
9	Financial (Banking)	Current Chief Operations Officer Former banking Chief Data Officer	32500	62
10	Insurance	Chief Operating Officer & Acting Chief Information Officer	5500	35
11	Financial (Banking)	Head of Business Enablement Former banking Chief Operating Officer	3600	55
12	Short Term Insurance	Chief Information Officer	1500	41
13	Financial (Banking)	Digital Transformation Executive	1700	59

Table 1 - Research interview participants

4.5.1 Participant Background

It is essential to take into account the participants' backgrounds in order to put the findings in perspective. Since many participants expounded on the phenomenon by drawing on their job experience, their previous and present roles and level of expertise in the industries are essential. When asked about their professional experiences and the effects of interventions on their organisations, several participants provided detailed accounts that illuminated the study issue. Consultancy, financial services, banking, and various types of insurance were all represented in the sample.

Thirteen participants were from large enterprises with more than 1000 employees. The size of the organisations was vital to keep within the bounds of the study, which focuses on corporate institutions. As such, it is clear that the responders' opinions and beliefs are admissible, given their extensive experience as team and organisation leaders in highly competitive industries.

Participants 1, 4 and 6 are not executives but are directly involved with organisational systems and the development and design thereof. They provided valuable insights into the adoption and use of data, systems and platforms in large organisations. Participants 2, 5, 7, 8, 10 and 13 are executives in the technology field and provided insights on the identification, exploitation, adoption and barriers to adoption of AI technologies in large enterprises.

Participants 3 and 12 are executives in the information and technology field who are responsible for the implementation of systems and platforms within large enterprises to drive innovation and large-scale adoption of technologies. The participants in this study are all highly experienced professionals with a variety of backgrounds and knowledge about the phenomenon under investigation. Their experience, expertise, and familiarity with the subject matter make them ideal study subjects for this research. In addition, their diversity in age and varied backgrounds also adds to the diversity of the information contained within this study.

4.5.2 Data Saturation

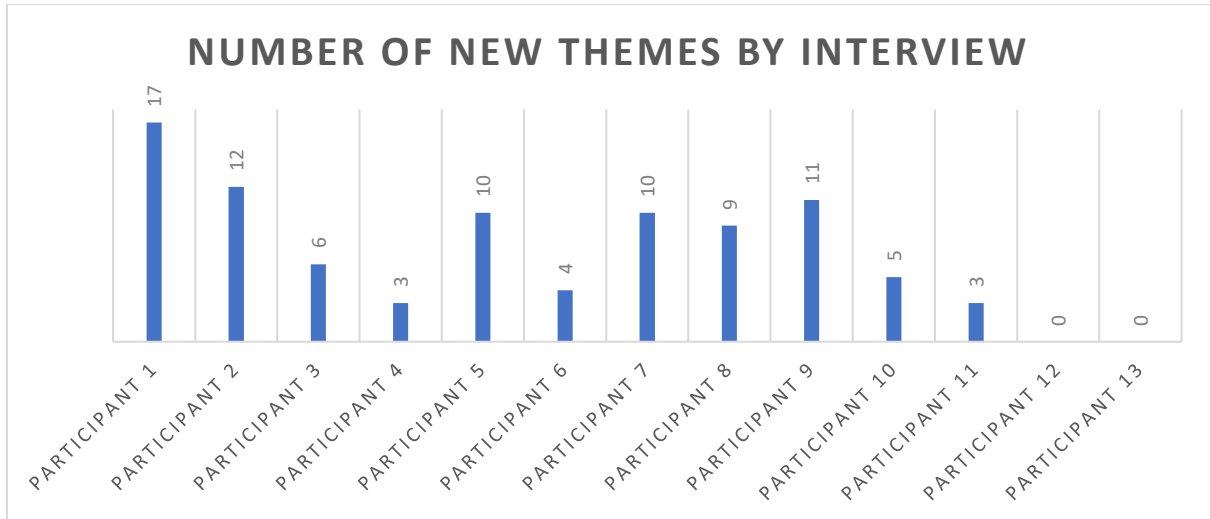


Table 2 - Number of new themes

4.6 RESULTS: RESEARCH QUESTION 1

RQ1 - What are the key factors of adopting CHI principles that may enhance corporate innovation in large enterprises?

Collective Hybrid Intelligence is defined as the symbiosis between human intelligence and Artificial intelligence, augmenting their strengths to increase the efficiency of job execution. It is an unquestionable fact that computers are better able to perform laborious computations or detect patterns in big data than their human counterparts (Frey, & Osborne, 2017), and it is, therefore, vital for organisations to be innovative and adopt AI technologies to remain relevant in a highly competitive business environment.

Corporate innovation refers to the introduction of new ideas, concepts or technologies in order to generate new value for the organisation. The purpose of this research question was to establish the critical factors that may enhance corporate innovation in large enterprises through the adoption of CHI principles. The interview questions were formulated to gather information on both “hard” and “soft” factors that might affect corporate innovation through the adoption of CHI, and participants were encouraged to provide real-world examples from their experience.

“Soft” factors that may enhance corporate innovation

4.6.1 Theme 1 – Talent Management

Talent management is an essential component of organisational performance and it has been identified as a vital factor influencing collective hybrid intelligence and its effects on corporate innovation (van Hoek et al., 2020). The human capital element of any company is a significant contributor to its productivity and profitability and therefore plays an important role in organisational success. By effectively managing a company's workforce, business leaders can increase employee engagement, encourage corporate innovation and reduce turnover, which are key factors in increasing productivity and ultimately driving profitability (World Economic Forum, 2020). Overall 11 out of 13 participants identified talent management is a critical factor affecting corporate innovation through the adoption of HCI. The primary subthemes related with talent management are discussed in the section below.

4.6.1.1 Training

Innovative business practices are essential to ensuring that organisations stay ahead of the competition and achieve long-term success (Cummings & Knott, 2018). By adopting CHI principles, companies can improve their ability to innovate and create new products, but only if the organisation possesses a strategy to keep employee skills relevant.

Most participants agreed that the business landscape and organisational structure would change with technological advancements and the adoption of CHI, which will result in the need for additional training for employees to remain relevant and to contribute to innovative practices.

Participant 3: “A lot of focus needs to be placed on training. So upskilling your workforce so that they can do higher level tasks, if they are not able to, then they will become redundant.”

Participant 5: “..There is a shortage of skills.. and training facilities.. with the biggest shortage of skills being on the data side.”

Participant 2: “..the skills development, I think, is more around kind of how to we better understand our business and customer problem and then there is obviously the technical development, which I think is the easier part to be honest with you.”

Participant 9: “There is innovation, it doesn't have to be tech. I think that's the other important thing. I play with innovation across a few things. One, when we talk about the people part of it... When we talk about enhancing the people, people learn to create value without having to go outside of their team. Right? That's, that's an innovation of innovation.”

Participant 13: “So the skills development could help them move to a different part of the business different parts of the value chain, to become more the advisors or

closer to the humans, or stay and continue to manage and support the machines that have taken over the bulk of the workload”

In order to foster creativity and encourage new ways of thinking, organisations must build a culture of innovation and embrace collective hybrid thinking. Corporate innovation should not only happen at senior management level, it should be part of the organisation's innovative culture, which is discussed in depth as part of the culture sub-theme in theme 4. Participants 1 and 3 stated that organisations that stimulate employee growth also encourage employees to be more innovative.

Participant 1: “So essentially, if people are encouraged to continue evolving or growing, and not necessarily stagnate in one place, that could help them feeling like there's new ways that they can add value which can encourage them to be innovative in their areas.”

Participant 3: “For any initiative to work, you need buy-in from the people, because ultimately they are the people who are actually going to make the project successful. If the culture is one of innovation, and learning, and they don't have a fear, or the fears can be mitigated, then it's going to be a lot easier to adopt.”

Participant 2 and 5 noted that traditional organisational roles will overlap as technology adoption and innovation increases, which will require additional training for the employees in both the technologies and the business domains

Participant 2: “A lot of the cultural shift, mindset shift and skills shift is going to be towards the use of technologies to augment or automate human skills. We are going to have an instance where employees will require T shaped skills and have a broad understanding of different domains to work and test solutions across domains.”

Participant 5: *“The job market is going to change significantly and a lot of the jobs that we currently know are going to disappear. Similar to the previous revolutions, new technologies will create new jobs, existing jobs will merge and organisations will have to keep up with the trends and training requirements to ensure their staff remains relevant.”*

Additionally, to ensure successful innovation management, organisations have put into place measures to promote a culture of innovation at various levels, which include creating awareness to the employees, developing organizational readiness, and establishing innovation metrics.

Participant 3: *“Creating that awareness in the organisation of what's happening is important. Sharing information, putting people's minds at ease, and giving them the opportunity to be innovative and do new work is key.”*

Participant 5: *“... it is important for organisations to ensure that the employees are efficiently trained and transitioned to the new tasks and be able to measure the value of tasks being automated.”*

4.6.1.2 Soft Skills

A strong foundation of soft skills from the human worker, such as critical thinking, collaboration, leadership, innovation and emotional intelligence is required for an efficient CHI environment within organisations (Wilson & Daugherty, 2018). Four participants identified soft skills like compassion, creativity, contextual awareness and cognitive flexibility as human specific skills within the CHI framework.

Participant 1: *“Humans are better at compassion, creativity and contextual awareness than machines... Computers are better at crunching large volumes of data and analysing it to help make sense of it.”*

Participant 2: *“We are seeing a requirement for a lot more critical analysis skills, and a lot more soft skills, emotional management, emotional intelligence and cognitive flexibility, we started seeing a lot more of those bubble up towards being more critical...”*

So the shift is not just the employee giving client information, because the information is easy to retrieve through this conversational AI capability. The role of the employee in that instance, then actually becomes more of kind of an emotional management of that of that engagement.”

Participant 8: *“And the usual generic argument that we always use as organizations is that the idea behind these technological advancements are really designed to enrich people's jobs by taking away all the menial stuff that can be automated, and rather positioning humans for what robots have not perfected, which is human to human interactions, so that the processes that underlie those interactions are then handled by technology”*

Participant 9: *“..if you can't put a real tangible value, then humans shouldn't be doing it.”*

4.6.1.3 Analytical Skills

Approaching the concept of corporate innovation is inextricably linked to the skill sets of the employees required to perform vital roles in symbiosis with technologies. The modern abilities demanded by CHI mean that organisations and human resource functions should concentrate on availability of specialist roles required as organisations attempt to be innovative to remain relevant and adaptable.

Eight participants identified talents as an important factor affecting innovation through CHI. In many instances, a lack of certain skills, particularly in emerging technologies, hinders an organisation's ability to adopt new technologies that facilitate innovation.

Participant 1: *“You have to build these specialist roles for all of these new technologies that you're taking on, so that you can drive the innovation and adoption.”*

Participant 2: *“We are seeing a requirement for a lot more critical analysis skills, and a lot more soft skills, emotional management, emotional intelligence and cognitive flexibility, we started seeing a lot more of those bubble up towards being more critical...”*

Participant 5: *“.. There is a shortage of skills.. and training facilities. with the biggest shortage of skills being on the data side.”*

Participants 2 and 5 noted the importance of data to effectively innovate and adopt CHI principles but mentioned that specialists spend too much time wrangling data instead of doing analysis. For this reason, they proposed that organisations will require more data engineers to free up time for data scientists to create models and perform the needed analysis for innovation.

Participant 2: *“If you take data scientists for example. They contribute significantly to innovation through the identification of trends in the data that can be used for innovation and new product development, but they spend about 60% of the time identifying data, cleaning data and ensuring data integrity, which is not optimal. If you think about the fact that data scientists are highly skilled and scarce resources, and you'd rather have them spending more time on the actual model development, testing and refinement, part of the process.”*

Participant 5: *“To me the biggest shortage of skills sets are on the data side, and I see those being twofold... when you do find a data scientist, they end up spending 80% of the time doing data wrangling rather than doing data science. So we're not necessarily deploying talents to the best of their capabilities... and that's where the*

data engineers come into place... to ensure that by the time the data gets to the data scientists that they can actually do the data science stuff. And that data engineering role is critical.

Participant 9: *“So I couldn't hire AI engineers fast enough. Because every time I hired an engineer, the security team was stealing them or the data engineering team was stealing them.”*

Participant 13: *“... data engineers. So your algorithms and your data scientists typically operate within one segment of the overall data value chain. It's actually the engineer that does the full value stream and the data science builds the algorithms. And when it's useful at the right time, and in the right context. You can hire all the data scientists in the world, but it's that data engineering that looks through the value chain.”*

4.6.1.4 Morale

Innovation is an important part of any company's success and growth. It can be said that without it, a company would soon become obsolete. Therefore, companies constantly innovate, to stay ahead of the competition. However, at times this can lead to technological displacement. This is when new technological advances replace older technologies and the workers who use them are no longer needed. Technological displacement, or the fear thereof can lead to employees sabotaging innovation and the adoption of technologies.

Participant 1: *“People are already feeling threatened by some of these things coming in sort of literally augmenting what they do. So, if a robot is mimicking what I'm doing, it threatens me from a job perspective. And people might potentially just sabotage it for the sake of the fact that it's actually coming to dislodge them from their bases of power”*

Participant 3: "... for some people, AI will have a negative impact because if you have an unskilled workforce, they are the first jobs to be automated, especially in our country. It's a big risk because there's no way for the unskilled to move to that next level and their jobs may get replaced."

Participant 5: "... my concern is more on the entry level side, you know, if we are automating all have very simple copy and paste tasks. What does that mean, from an organisational perspective and does that mean that we are employing less people in junior positions?"

Participant 1: "You may find in organisations where people are more open to innovations or trying out new stuff, but when it disturbs the balance of power. I suspect they may not be as well received."

Participant 7: "when you introduce new technologies, there is so much resistance with the colleagues"

Participant 8: "people are still threatened by technology ... invest a little bit more in understanding what people are afraid of and manage that... how do we get people past that fear and have them just embracing technology"

Participant 9: "we unfortunately did have to have to kill a few roles, and there were some redundancies, and I added myself to that list."

To mitigate the risk of employees feeling threatened by technologies and sabotage innovation it is vital for organisations to be transparent about innovation and discuss the benefits thereof with employees.

Participant 3: *“I think the onus is on leaders and organisations to train the workforce to start doing this higher level work and making room for them in organisations and for people to buy into this and actually go on that journey... it's a tight balance, but with great technology, great people management skills, and a good support structure around it, early adopters definitely make a difference.”*

Participant 7: *“If you do not apply change management from the beginning and talking to both the mind and the heart of the individual that will be impacted by the technology, you are going to fail”*

Participant 7: *“I think how you mitigate this thing is to show the employees through this change management process, that their life is going to be so much better in terms of their skill set in terms of their upskilling, in terms of their productivity in the office and at work and in terms of their personal life, their relationships, spending time with their family and friends.”*

Participant 13: *“And people are motivated by three things, autonomy, mastery, and purpose. So when you give people that third one, the purpose you motivate them to change to keep working, supporting, actively participating, when they lose that sense of purpose, and you can take away the other two as well.”*

4.6.2 Theme 2 – Change Management

4.6.2.1 Change Management

Change management is an essential part of any organisation's strategic planning process and its ability to adopt emerging technologies has become increasingly critical. For many organisations, change management can be a complex process due to the numerous challenges involved, such as technological unemployment and workforce resistance to change.

Leaders should be transparent about innovative changes that might affect employees and bring them onto the journey of modernisation. They should also clearly outline the benefits the change will bring and keep employees updated on the progress of the change.

Participant 2: *“Leaders should carefully consider how they bring people onto the journey of modernization and the adoption of technology to create new value-adding roles that are not too far detached from the employees’ current skill levels.”*

Participant 7: *“So you train people on that. And then also to talk to the heart, you have got to show the benefit to the individual, and not just the benefit to the company. Because as a leader, I want to experience efficiencies in the business, the employee doesn’t want to experience efficiencies, the individual wants to experience growth, and they want to experience a work life balance”.*

Participant 3: *“If computers are taking over some of the tasks of the human workforce, it could cause animosity, pushback against that... from a leadership perspective, creating that awareness of the impact is vital. So information sharing, putting people’s minds at ease, and giving them the opportunity to do new work.”*

Participant 7: *“And if you position the transformation in a positive way, it has a better chance of survival so that people don’t say this thing is going to replace me. We should tell them that we are going to augment this task, because there are certain things that a machine will never do, that machine will not be able to serve its customers with a smile, then it means that we, as leaders have to show employees that servicing customers is a premium skill”*

Participant 7: *“...you have to include people from the beginning... thats change management but its also the involvement and contribution into shaping those technologies so that people understand how those technologies are going to support them.”*

Participant 8: *“it starts on that journey of digitization or technological advancement, whatever you want to call it, you have to include people from the beginning. So that change management but also that involvement and contribution into shaping those*

technologies so that they understand how those technologies are going to support them. And it's not something that is pushed on people that says, Oh, we you know, want to do that process like this."

Participant 10: *"it's important for me that the employees understand the benefit that they're going to get out of this. So it's not about - we are doing it to you, it is we're doing it for you and you are part of the process. So for me, it's about they needing to be part of the journey. They need to understand exactly the benefit for them, and why we are doing it and then we refer to change management."*

Participant 12: *"it starts with a little bit of education within the change management process, I think it's important for, for our employees to understand the why behind some of the decisions that we take at a management level"*

4.6.3 Theme 3 – Leadership

4.6.3.1 Strategic Innovative Leadership

Strategic leadership is increasingly being called for as businesses strive to stay ahead of the competition. To be successful in this competitive environment, leaders must adopt innovative practices that break the mould and set their organisations apart. The respondents were asked about the leadership traits that motivates corporate innovation while also promoting the adoption of CHI principles.

Participant 7 suggested that leaders who are open and vulnerable to accept new ideas and acknowledge individuals for innovative ideas actively promote innovation amongst other peers.

Participant 7: *"I think the type of leadership that drives innovation is just being open and vulnerable about what you don't know. When a leader acknowledges an individual for their idea the leader is effectively inviting other colleagues, both experienced and new colleagues to also be innovative."*

Participant 8: *“People need to see you celebrate when somebody wins. And it doesn't always need to be in a monetary way. But when you don't do that people don't feel like it's a thing they should do.”*

Three participants added that leaders should propose the steer that the organisation should take, promote new innovative technologies and ensure that the structures are in place for employees to be innovative.

Participant 7: *“Technical leaders should be evangelists of new technologies and promote its value to business leaders”.*

Participant 3: *“The leader should propose the direction that the organisation should take to be innovative and competitive in the current business environment, or to cater for the future.”*

Participant 2: *“It is the responsibility of the leader to ensure that there is an appropriate technological landscape and structure to be able to adopt new technologies.”*

4.6.3.2 Change Agent

There is no doubt that technological advances play a critical role in the corporate world, as they offer new ways to conduct business, interact with customers and partners, and generate new revenue streams, but who in the organisation should be responsible for exploration and identification of technologies that would benefit the organisation?

Four participants agreed that it is important to have a strategic position that is responsible for championing technological innovation and to ensure that innovation strategies are managed and progress is measured.

Participant 1: *“... employ a digital officer or create a strategic position to take care of innovation and technology exploration.”*

Participant 3: *“.. let's call him the Chief Digital Officer, if he is the expert in that field, you should be a champion for it, but it should never be prescriptive. He should propose the steer that the organisation should take to be innovative and competitive in the current business environment, or to cater for the future. So that type of innovation can be championed by the Chief Digital Officer”*

Participant 5: *“... a trend that started quite recently is for organisations to have a chief AI officer and that Chief AI officer's role is two-fold. The first is to explore the capabilities that AI brings to the organisation ... There's a second part of that role, and that's ensuring ethical AI, ensuring that your datasets aren't biased, and ensuring that you're not using AI for bad purposes.”*

Participant 7: *“If innovation strategies are not measured and not managed, it is not going to be done? You do need to have somebody that's going to be responsible for driving innovation in the business.”*

Participant 8: *“Should it be a standalone function? Probably not... In our organisation, it's the strategy units, that are supposed to drive innovation... it is also not an IT thing, by the time innovation comes from IT it is an IT innovation as opposed to a business innovation.”*

Participant 9: *“You only need a chief data officer if you are still learning about data. If you've cracked the nut, no need for it... who initiates it, you've got to have that person. Often it falls onto the techies, the CTO, CIO, CTO, something to be constantly looking on the horizon for what's coming up for our business. Right. And that's probably the right person because they are able to filter through the tech, the tech speak, and get to the business message quickly.”*

Participant 10: *“But I think my belief is they should be a central area that does the research and the investigation. And once they've done it, to engage with the CIOs, make them aware of it, and then go on a journey to say, ‘‘how do we do this? We want to use it, not use it, because the businesses are different, different stuff works with different businesses.”*

Additionally, to having a single executive member championing innovation, the majority of participants agreed that innovation should not be the sole responsibility of a single person, it should be part of the organisation's culture and DNA. Everybody in the organisation should be encouraged and rewarded to come up with innovative ideas.

Participant 3: *“I don't think exploration or innovation should be reliant on one person, because that person could leave, or could not be very good at what they do as well and cause organisations to get stuck.”*

Participant 4: *“So my view is that culture and skills are really the two things that put organisations in a position ... to free up what is the absolute maximum ability of a team to innovate.”*

Participant 1: *“The only leverage that you actually have to innovate is your culture. If the culture itself is not a culture that is innovative, or that pushes innovation, to improve innovation in any other way, it becomes a hard ask.”*

Culture as a factor of innovation is discussed in depth as part of Theme 4.

Furthermore participant 2 reiterated that the group CIO should be accountable for ensuring the organisation has the correct structures and processes in place to enable innovation.

Participant 2: *“Obviously, the Group CIO is accountable for ensuring that we have that ability to be able to adopt new technologies”*

4.6.4 Theme 4 - Culture

4.6.4.1 Culture of innovation

An innovative culture promoting technology adoption in organisations is key to competitive business performance. Therefore, it is vital for organisation to foster a culture of innovation by nurturing innovative ideas and encouraging their implementation through appropriate mechanisms. All the participants agreed that culture plays a key role in an organisation’s ability to be innovative and to collaborate with emerging technologies.

Participant 1: *“Companies with innovation designed in their DNA and part of the culture find it easier to innovate... The only leverage that you actually have to innovate is your culture. If the culture itself is not a culture that encourages innovation, or that pushes innovation, to improve innovation in any other way, it becomes a hard ask.”*

Participant 2: *“If the company culture is one that buys into innovation, then you will be able to get through this much easier.”*

Participant 3: *“There needs to be really close collaboration between the business and technology areas, two worlds colliding, but it should be something that is culturally entrenched.”*

Participant 4: *“So my view is that culture and skills are really the two things that put organisations in a position ... to free up what is the absolute maximum ability of a team to innovate.”*

Participant 6: *“a cultural change can help build up a culture and environment within the organisation so that it can encourage innovation... everyone has some ideas, it's basically giving them a platform to showcase their ideas”.*

Participant 7: *“organisations that are innovating, they got the culture right... innovation has to be in the DNA of the organisation... because culture trumps strategy ...”*

Participant 9: *“culture is critical for innovation. In the sense that everybody needs to understand where we are going and what it's going to feel like because culture is what it feels like. Right? So it's hard to change culture. And that's why most change management is a problem. It's hard to get people to feel like the new when they've been in the old for so long”*

Participant 10: *“So for me it is the culture, which includes innovation draws a certain individual, and if it's the right fit for the culture that basically will stay if it's the wrong fit”*

4.6.5 Theme 5 – Technology

4.6.5.1 Data and Analytics

The role of data in corporate innovation has come into increasing focus in recent years. A 2015 study by Gartner mentioned that data is the "oil" of business innovation, and it has become increasingly crucial for companies to get their data strategy right.

Participant 7: *“...Data is the new gold, or even the new oxygen of the organisation... If you do not manage your data, you are going to be out of the market without a doubt.”*

Participant 2: *“...a lot of organisations have a data strategy, but it's not necessarily owned at the right level... The data strategy should be owned and executed by*

somebody sitting in the C suite. Because that's the only way to influence all areas in the organisation.

”

Participant 3: *“Many business leaders do not want to pick up the cost because they don't see the value in having the data.”*

Participant 9: *“So can you see now what I did was I didn't dilute the value of data, I actually said to the business, you need to own the data, because it's your data... You only need a chief data officer if you are still learning about data. If you've cracked the nut, no need for it.”*

Participant 2: *“So technologies like augmented analytics can assist with the data science capacity problem ... who as a result would be able to suggest a broader range of potential solutions or models that could be developed.”*

Participant 3: *“And because of this time, that's freed up, people stimulate a lot of innovation. And people have more time to think strategically, to plan for the future to analyse data”*

4.6.5.2 Augmenting Human Capacity

One of the key steps that any business should take towards innovation is creating capacity for it within the organisation. This means that the company must be willing to invest time and resources into cultivating an innovative culture, adopting innovative technologies and encouraging employees to engage in innovative practices while also freeing up employee time to enable innovative practices. During the interview process a theme that resonated with the majority of participants was the fact that the adoption of CHI principles will free up human capacity in the organisation which can then be redirected towards creative and innovative processes.

Participant 1: *“Robotic process automation is essentially just helping us scale... You still have some time when a human being is needed in the mix, but in general, for scale purposes, you put robots as a way to augment the capacity and free up time.”*

Participant 2: *“If you take a crap process, and automate, it's going to be a crap process. So as part of implementing RPA, you need to have the skill set to identify what are well designed processes, which processes need to be changed. And then automated, and which processes need to be changed by virtue of automating them? And in what ways do they need to change and towards what ends right.”*

Participant 3: *“Technology sets are there for people to innovate, the dependence on having the technical knowledge of a specific domain is reducing because something like low code makes it easy for anybody to go and build something... So I think it is quite a nice time to be involved in business and technology and product development across the different industries and segments. Because as we start freeing up the time for people and the skills are getting more advanced, I think the future is going to show us some interesting and exciting new innovative ideas.”*

Participant 6: *“..new technology opens up a new opportunity for humans to be built upon.”*

Participant 2: *“But for the most part, technology is an enabler, we still need people, we still need processes and only then comes technology.”*

Participant 10: *“So for me, it's the ideal combination if you need the people to come up with ideas, to be the innovators. And for me the machines are repetitive they become doing it over and over.”*

Participant 4: *“... through hybrid principles you can actually take the work much further upstream and literally reduce something that is currently a 16 hour task into like a 15 minute task.”*

Participant 5: *“...technology is taking away a lot of the heavy lifting stuff that took up time... it frees up time for people to focus on more meaningful tasks.”*

Participant 10: *“We can automate to create more capacity that we can utilise your skill and your knowledge better.”*

4.6.6 Summary of Research Question 1 Findings

The data analysis revealed five major themes and eleven sub-themes that have enhanced corporate innovation through the adoption of CHI. The primary themes and relevant sub-themes identified in the study in relation to the first research question enabled the researcher to develop the initial part of the conceptual model on CHI, which is depicted in Figure 2.

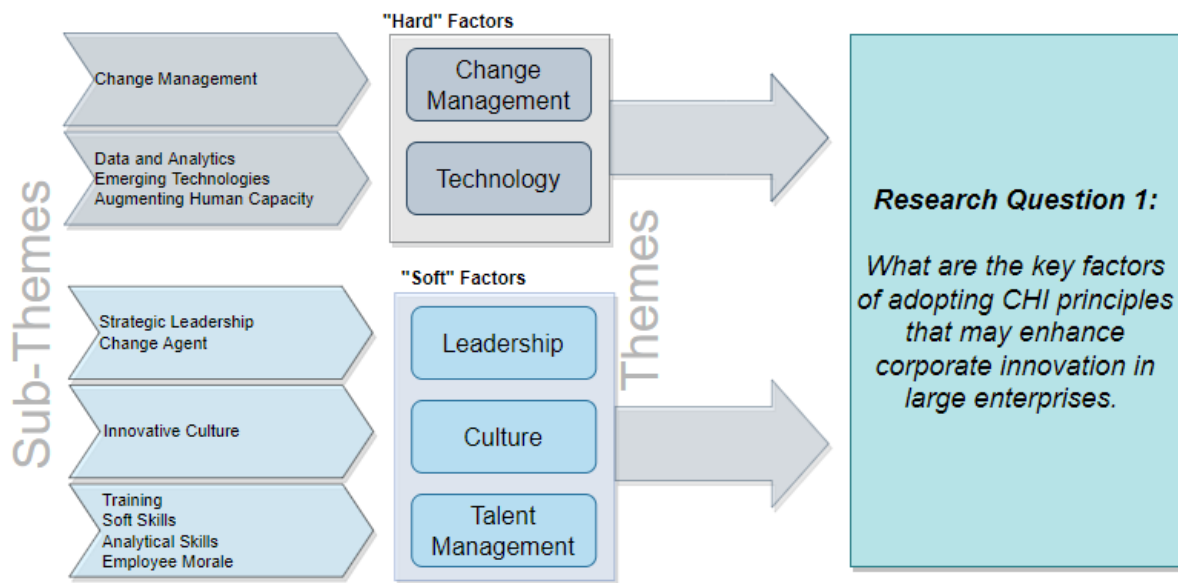


Figure 2 - CHI factors enhancing corporate innovation

4.7 RESULTS RESEARCH QUESTION 2

RQ2 - What are the key factors of adopting CHI principles that may enhance process efficiencies within large enterprises.

The term CHI refers to the symbiosis between human workers and AI technologies, augmenting their strengths to increase the efficiency of job execution. It is built on the idea that humans and computers have complementary capabilities and strengths that can be combined to supplement each other and improve their combined abilities and efficiencies (Dellermann et al., 2019).

The purpose of this research question is to establish the critical factors related to the adoption of CHI principles that may enhance process efficiencies in large enterprises. In a competitive business environment enhanced process efficiencies can lead to a greater competitive advantage of an organisation over its competitors.

4.7.1 Theme 1 – Talent Management

4.7.1.1 Training

Employees play a critical role in organisational success, and their training is an essential part of developing the skills needed to excel in the workplace. In this section, the researcher explored the importance of employee training when it comes to adopting hybrid intelligence principles to enhance process efficiencies. The majority of participants agreed that training, upskilling or relevant skilling practices are required for employees to work with technologies and even more so if organisations want to enhance efficiencies.

Participant 3: “A lot of focus needs to be placed on training. So upskilling your workforce so that they can do higher level tasks, if they are not able to, then they will become redundant.”

Participant 2: “And so there's a potential to actually generate more value through letting people be upskilled and engage in those higher-order activities.”

Participant 5: *“... it is important for organisations to ensure that the employees are efficiently trained and transitioned to the new tasks and be able to measure the value of tasks being automated.”*

Participant 7: *“The soft skills are critical, but more difficult to train, because we are not our education is not yet, you are not taught to smile at an auditor and tell them that I want to help you to make sure that we get this thing by coming forward. So that reskilling is absolutely critical“*

Participant 9: *“We must make sure that people skills remain relevant. Now. That's not the employees responsibility. Because we bring an employee in to do a job and either my tech changes, my customer changes, my market changes, or my product changes. The employee skills are not going to change until I change them.”*

Participant 10: *“The human factor comes into play when we bring complexity to the task, so I think, we got to address how we scale people for collaboration, how we kill people to work side by side with technology, that actually takes over some tasks.”*

Participant 13: *“So the skills development could help them move to a different part of the business different parts of the value chain, to become more the advisors or closer to the humans, or stay and continue to manage and support the machines that have taken over the bulk of the workload”*

Participant 8 had an opposing view and mentioned that current user-centric technology designs makes it relatively easy for low-skilled employees to adopt new technologies. She continued by stating that employees will embrace new technologies if the fear of technologies and technological displacement is removed.

Participant 8: *“I don't think there's a need for upskilling. I think there's a need to, to invest a little bit more in understanding what people are afraid of and managing that.”*

Mitigating the fear of technology is discussed in depth in Theme 3.

4.7.1.2 Skills

The use of human intelligence is a vital part in the process of adopting CHI into an organisation or organisation level strategy. The incorporation of CHI principles into an organisation's strategy and implementation plan may be facilitated by the use of human intelligence as it can enable employees to identify areas for improvement which can support further implementation of CHI principles and activities within an organisation. Human intelligence remains a crucial component of improving process and service innovation for organisations and should be fostered rather than replaced if a company wishes to drive innovation and reduce costs through the adoption of CHI principles. Participants were asked about the skills that are only relevant to human employees and not achievable by AI yet. This will allow the researcher to gain more information on human intelligence to get a better understanding of its purpose as part of CHI.

Participant 7: *“there are certain things that a machine will never do, that machine will not be able to serve its customers with a smile”*

Participant 8: *“... you want to bring the human element to business, rather than people doing what machines should ideally be doing.”*

Four participants identified soft skills like compassion, creativity, contextual awareness and cognitive flexibility as human specific skills within the CHI framework.

Participant 1: *“Humans are better at compassion, creativity and contextual awareness than machines... Computers are better at crunching large volumes of data and analysing it to help make sense of it.”*

Participant 2: *“We are seeing a requirement for a lot more critical analysis skills, and a lot more soft skills, emotional management, emotional intelligence and cognitive flexibility, we started seeing a lot more of those bubble up towards being more critical...”*

So the shift is not just the employee giving client information, because the information is easy to retrieve through this conversational AI capability. The role of the employee in that instance, then actually becomes more of kind of an emotional management of that of that engagement.”

Participant 8: *“And the usual generic argument that we always use as organisations is that the idea behind these technological advancements are really designed to enrich people's jobs by taking away all the menial stuff that can be automated, and rather positioning humans for what robots have not perfected, which is human interactions, human to human interactions, so that the processes that underlie those interactions are then handled by technology”*

Participant 9: *“..if you can't put a real tangible value, then humans shouldn't be doing it.”*

Two participants also identified the need for humans to be able to identify well designed processes, technology requirements and process changes required for the processes to be effectively automated.

Participant 2: *“If you take a crap process, and automate, it's going to be a crap process. So as part of implementing RPA, you need to have the skill set to identify what are well designed processes, which processes need to be changed and then automated, and which processes need to be changed by virtue of automating them? And in what ways do they need to change and towards what ends right.”*

Participant 8: *“... you have to include people from the beginning to promote involvement and contribution into shaping those technologies... there is also a tendency to just take what humans do manually and automate exactly the same process with RPA in an attempt to enhance it, make people more productive than they would be, but that only results in the automation of an already bad process.”*

Participant 10: *“machines should do the repetitive tasks and they can do it quickly, and they don't mind it that it's the same thing over and over and over again. But it is the humans who identify the innovations and make it happen.”*

4.7.2 Theme 2 - Leadership

4.7.2.1 Strategic Leadership

The current global business environment is rapidly evolving, with new technologies and process improvements becoming increasingly important to remain competitive. Therefore, organisations need to continuously strive to enhance their efficiency, improve operating performance and reduce operating costs by adopting new technology. This can be achieved by promoting the adoption of the latest innovations and latest technologies within the organisation and enhancing people's skills to enable them to take advantage of these new technologies. Leaders within companies play a critical role in driving this process of transformation and acting as role models for other employees to adopt the same attitudes and behaviours. Five participants contributed to the notion that leaders have to take the lead in technological collaboration and allow employees to follow in order to enhance efficiency.

Participant 8: *“ Walk the talk... because your employees will stay in their comfort zone, but if they see you doing something different, they will more than likely copy.*

Participant 3: *“And with new technology, I think a big difference, as well as leaders in organisations that have some technical background, so it's good if they are*

aware of the landscape and can explain it, and then it's easier to get this through and over the line. And for it to be a success, you will need some sort of executive sponsorship as well.”

Participant 7: *“For the CTO, or CDO (leaders) it's about being an evangelist to say now, but we can have improved efficiencies if we were to use technology in this. These are the technologies that you are using, and these are the benefits that we will be getting from these technologies.”*

Participant 8: *“Your top tier leadership needs to embrace these things. First, you need to convert them to champions, and lead by example, servant leadership... if you can get people at the top, embracing those technologies, the rest is easy, because it compels everybody else to come on board.”*

Participant 9: *“But I think more and more we are starting to see that responsibility now sit with boards themselves, sit with an entire exco themselves. Everyone is expected to be techie enough for you know, involved enough.”*

Participant 10: *“So for me is it is good that they (leaders) understand technology and the benefits of it and that they could have experienced, even if they've seen what technology can do, but don't necessarily have to have in-depth knowledge of technology.”*

4.7.2.2 Data Driven Decision-Making

With data becoming increasingly important in business decision making, corporate leaders are using a variety of methods to access and analyse data to inform decision-making processes. The use of data in business decisions is becoming increasingly prevalent due to the increased availability of data and the advances in technology that make accessing and analysing data easier. Five participants agreed that leaders should use data to inform their decisions.

Participant 10: *“So up till now, I think leadership and management a lots of times has operated on the gut, or who shouts the loudest or what is in the system. With the data and analytics and the insight you get from data, you can make a lot more informed decisions”*

Participant 1: *“Using automated decisioning tools that actually help with some of the decisions that could potentially be codified.”*

Participant 4: *“what kind of tools and datasets can we (managers) use that will give us the insights into the way that we’re working to highlight where the inefficiencies are”*

Participant 5: *“... the efficiency comes from gathering data, managing data, understanding what the patterns are, and what those patterns tell you.”*

Participant 8: *“data is an asset to a company, because if you do not leverage that asset (for decision-making), then you definitely are not going to experience the same type of growth that your competitors who leverage those that knowledge would have.”*

4.7.3 Theme 3 - Change Management

4.7.3.1 Creating Awareness

It is imperative that managers effectively manage the development and implementation of new technologies to ensure that they meet the specific needs of the organisation and its employees and do not disrupt existing business processes. Effective change management was identified by 5 participants as being essential for the successful adoption of technologies as part of the CHI principals. The participants noted that employees should be included in the process from the beginning to ensure their buy-in.

Participant 8: *“...it starts on that journey of digitization or technological advancement. You have to include people from the beginning to change management and also that involvement and contribution into shaping those technologies so that they understand how those technologies are going to support them.”*

Participant 3: “And then from a leadership perspective, creating that awareness and organisation of what's happening. So information sharing, putting people's minds at ease, and giving them the opportunity to do new work.”

Participant 9: “It operates for you know, maybe five times longer than a human can. Or a single human can. It doesn't need tea breaks, it doesn't need lunch breaks, it docks itself. But now you don't tell them this, the scariness of the change management must still come.”

Participant 10: “But I think it's the way you do that change management. You've developed or implemented something and then the adoption from employees are very difficult because, although they don't understand this all they see is: You are taking my work away. You want to safeguard cost and I'm gonna get retrenched versus we incorporate them from day one and a part of our stakeholders”

4.7.3.2 Perception of value

The level of trust that employees have in technology will also influence their perception of its value to the organisation and therefore their overall satisfaction with the new technology. Six participants emphasised the importance of employees having a clear understanding of the benefits they will achieve from working with technology. Furthermore, most of the participants were of the opinion that encouraging employees to collaborate with technology will increase their efficiency and will therefore improve the organisation's overall performance.

One of the interview participants made an interesting statement that there is no training on how to use WhatsApp, Facebook, or Uber. People figure it out because they identify the need and want to use it.

Participant 8: *“Nobody teaches anybody how to use WhatsApp, Facebook or Uber... if people want to use technology they will find out how to use it.”*

However, in organisations users often resist the adoption of technology due to fears of technological displacement or because they feel that the technology they have is acceptable. It is therefore important to identify and clearly articulate the benefits for them to create a need amongst them to embrace the technologies and improve their processes and efficiency.

Participant 10: *“it's important for me that the employees understand the benefit that they're going to get out of this. So it's not about - we are doing it to you, it is we're doing it for you and you are part of the process. They need to be part of the journey, they need to understand exactly the benefit for them, and why we are doing it.”*

Participant 7: *“... also to talk to the heart, you have got to show the benefit to the individual, and not just the benefit to the company.. the employee doesn't want to experience efficiency, the individual wants to experience growth, and they want to experience a work life balance”.*

Participant 8: *“... the idea behind these technological advancements are really designed to enrich people's jobs by taking away all the menial stuff that can be automated”*

Participant 2: *“...it's not about the tech, it's about what the technology enables for people.”*

Participant 3: “make sure that employees are aware of the changes and how it will impact them. “

Participant 13: *“And people are motivated by three things, autonomy, mastery, and purpose. So when you give people that third one, the purpose you motivate them to change to keep working, supporting, actively participating, when they lose that sense of purpose, and you can take away the other two as well. But when they lose that sense of purpose that's when you know, all the change management strategies in the world are not going to work”*

Participant 13 noted a virtuous cycle when employees resist the adoption of technology.

Participant 13: *“Even if the machines are doing 80%, the 20% that the humans are doing, can still grow year to year and still absorb more humans. And in actual fact, it's counterintuitive because the more humans resist Intelligent Automation, the less competitive the business becomes. And the less it's able to support a human complement, the more efficient the business comes”*

4.7.3.3 Disarm the Threat of Technology

There was a great deal of talk among participants about the potential for technologies to enhance process efficiencies within organisations. Many believe that these new technologies provide the key to improved efficiencies, better customer service and a competitive edge over competitors. However, while employees see technology as a threat to their livelihood, they will not embrace the change and therefore organisations will need a strategy to disarm this threat.

5 participants stressed the importance of making employees part of the transformation journey to improve their understanding of the benefits of working with technologies and therefore reducing the perceived risk of technological displacement.

Participant 8: *“people are still threatened by technology ... invest a little bit more in understanding what people are afraid of and manage that”*

Participant 2: *“So that to me is a very practical example of kind of trying to fight against technological displacement. And saying (telling employees) you are shifting people into higher value roles.”*

Participant 9: *“The next thing is to make this thing to disarm the threats that this tech pose to employees. What does this thing do? It does one thing, but very well. It operates five times longer than a human can. It doesn't need tea breaks. it doesn't need lunch breaks... But we don't tell the employees that, we show them the benefits of how this tech. can improve their lives.”*

Participant 7: *“there are certain things that a machine will never do, that machine will not be able to serve its customers with a smile, then it means that we, as leaders, have got to show employees that servicing customers is a premium skill. It is better than balancing spreadsheets by putting a premium on that and showing them that they are servicing customers. The diversification of skills is much more important than the work that the person was doing”*

Participant 10: *“it's important for me that the employees understand the benefit that they're going to get out of this. So it's not about - we are doing it to you, it is we're doing it for you and you are part of the process. So for me, it's about them needing to be part of the journey. They need to understand exactly the benefit for them, and why we are doing it and then we refer to change management.”*

Participant 10: *“So start with something small, which is not that threatening. And then as you build on this go a little bit bigger, a little bit bigger.”*

4.7.4 Theme 4 – Technology

4.7.4.1 Identify the Role of AI

The role of human skills to improve efficiencies as part of HCI was discussed in Theme 1. In this section the researcher asked the participants what the role of technology would be in the process. There was a consensus among participants that there is a clear distinction between what humans and AI are better at and therefore it is important to clearly identify the role of AI in the organisation.

Participant 9: “There's a whole bunch of things that we're giving humans to do, that AI can do, that analytics can do, that automation can try. And that's the meeting point to generate this hybrid intelligence.”

Participant 5: *“So don't necessarily go in with this big heavy AI hammer to address something that can resolve quite easily.”*

Participant 8: “you want to bring the human element to business, rather than people doing what machines should ideally be doing.”

Five participants identified routine repetitive tasks as likely tasks to be enhanced through automation processes.

Participant 1: *“Some of the processes that we have are quite repetitive in nature. And you can see that there is a potential to ensure that the process has some ability to scale based on usage of robotic process automation.”*

Participant 2: *“what are the routine repetitive things that I can identify and that I can essentially hand over to some sort of machine or system to be able to take care of so I can focus on things that require a bit more kind of cognitive processing, right, or at least creativity.”*

Participant 8: *“Technological advancements are really designed to enrich people’s jobs by taking away all the menial stuff that can be automated...”*

Participant 3: *“...strategically digital transformation is part of the organisation’s vision and goals, this is where we want to increase efficiencies by X percent based on doing automation of repetitive tasks, or adopting AI...”*

Participant 10: *“So our focus has been on the mundane tasks, to automate those so that the humans that we’ve got, can focus on the functions where we need people.*

Additionally, four participants mentioned that decision engines and virtual assistants could improve efficiencies by augmenting the human decision-making capability.

Participant 1: *“we are using decision engines. So building automated decisioning tools that actually help with some of the decisions that could potentially be codified.”*

Participant 2: *“For the service agents, if you think of it that way, a member asks a question from a human, but the bot suggests the answer. And then the human can cut off, assess whether that’s relevant, and then provide the answer... look at interaction management... there’s a range of technologies that can provide operational efficiency just within that process... technologies like augmented analytics can assist with the data science capacity problem ... who as a result would be able to suggest a broader range of potential solutions or models that could be developed.”*

Participant 4: *“And you can move again ... into full cognitive automation, where you’ve got decision making based on technologies such as Tron, which is this complex decision making engine.”*

Participant 5: “And based on an event or a series of events, you can reach out to a customer, you know, avoiding that, waiting for the customer to contact you. You start activating more tasks. So you start getting more into an active self servicing type environment where you can perform a lot of functions using that virtual assistant or having that virtual assistant perform functions for you. Your domain starts increasing.”

Three participants also identified data gathering, data management and automated business intelligence as possible processes that can be enhanced by adopting AI.

Participant 5: *“So I think the efficiencies in gathering data, managing data, understanding what the patterns are and what those patterns tell you can really only be done in the forms of big servers and AI sitting on top of it. But again, I think any recommendation that comes out of the AI capability needs to be managed and well understood and humanised.”*

Participant 9: *“Yeah, see, and then value the data. If you cannot put a value on it, then don't do it. Make a machine do it. So if you can't put a real tangible value, then humans shouldn't be doing it. Which is why BI was becoming more and more automated. I can go and ask the technology a question. Please tell me which were my top five bills from last month's natural language query, easy to get an answer, right?”*

Participant 5: *“..tool-sets we use that gives us the insights into the way that we are working to highlight where the inefficiencies are and gives management enough reporting and stats to get a sense of how to resolve inefficiencies. Those are the most important tools to enhance efficiency.”*

4.7.4.2 Increased Capacity

Technology has the potential to improve human capacities and efficiency in many ways. It can help employees communicate more effectively, work faster and smarter, and streamline daily routines. Workplace automation using technology has been shown to reduce human error and improve efficiency by automating repetitive or menial tasks, freeing workers up to engage in more meaningful work. There was consensus among the four participants that technology enhances human capacity and allows them to devote their time to more meaningful tasks.

Participant 1: *“Robotic process automation is essentially just helping us scale... You still have some time when a human being is needed in the mix, but in general, for scale purposes, you put robots as a way to augment the capacity and free up time.”*

Participant 4: *“... through hybrid principles you can actually take the work much further upstream and literally reduce something that is currently a 16 hour task into like a 15 minute task.”*

Participant 5: *“...technology is taking away a lot of the heavy lifting stuff that took up time... it frees up time for people to focus on more meaningful tasks.”*

Participant 10: *“So our drive is to create capacity. Our focus has been to automate the mundane tasks so that the humans that we've got, can focus on the functions where we need people.”*

In addition, participant 10 pointed out that higher capacity does not necessitate fewer workers, but that the organisation will not require more workers as it expands in the future.

Participant 10: *“We want to automate all of those. So we're not going to get rid of you as a human being but we do not want to have to employ more people to handle the capacity. So as the volumes grow, we want to say which is the staff We can*

automate to create more capacity so that we can utilise your skill and your knowledge better.”

4.7.5 Theme 5 - Culture

4.7.5.1 Culture of Technological Trust and Learning

To effectively achieve process efficiencies and meet organisational goals, it is necessary for organisations to develop a trust in their technology implementation (Cummings, 2018). Developing an organisational culture where employees feel they have the security and confidence in using their technological devices is essential to ensuring the success of the technology implemented within the organisation. When individuals feel that they have this level of confidence, they are more likely to use these technologies in the workplace, resulting in increased productivity for the organisation as a whole. Four of the participants stressed the need for an environment where employees feel comfortable with and confident using new technologies. In the absence of such a culture, it will be exceedingly challenging to encourage employees to adopt technology to enhance process efficiencies.

Participant 8: “people are still threatened by technology ... invest a little bit more in understanding what people are afraid of and manage that”

Participant 9: “if you get consumer or user trust in your technology, that's half of the issue resolved, then you spend the rest of your effort around building the experience for the people who are consuming this thing.”

Participant 5: “there's almost inherent trust concerns and as AI becomes more advanced and more decisions gets made. We need to be very aware of allowing AI to make the decisions without human interference.”

Participant 8: “there was never any doubt about the efficiencies technology can introduce, it's again, that adoption issue, what I've seen is, again, still that distrust

of technology, you will put the technology in, and people will continuously still have this need to check.”

Participant 10: “So for me, it's important that they can understand the benefit of technologies and what it can bring them because if they are totally anti-technology, it becomes very difficult to implement something. And by the trust, because they are very sceptical then of using technology to optimise for efficiencies.”

4.7.6 Summary of Research Question 2 Findings

The data analysis revealed five major themes and ten sub themes that can improve process efficiencies through the adoption of CHI. The primary themes and relevant sub themes identified in the study in relation to the second research question enabled the researcher to develop the second part of the conceptual model on CHI, which is depicted in Figure 3.

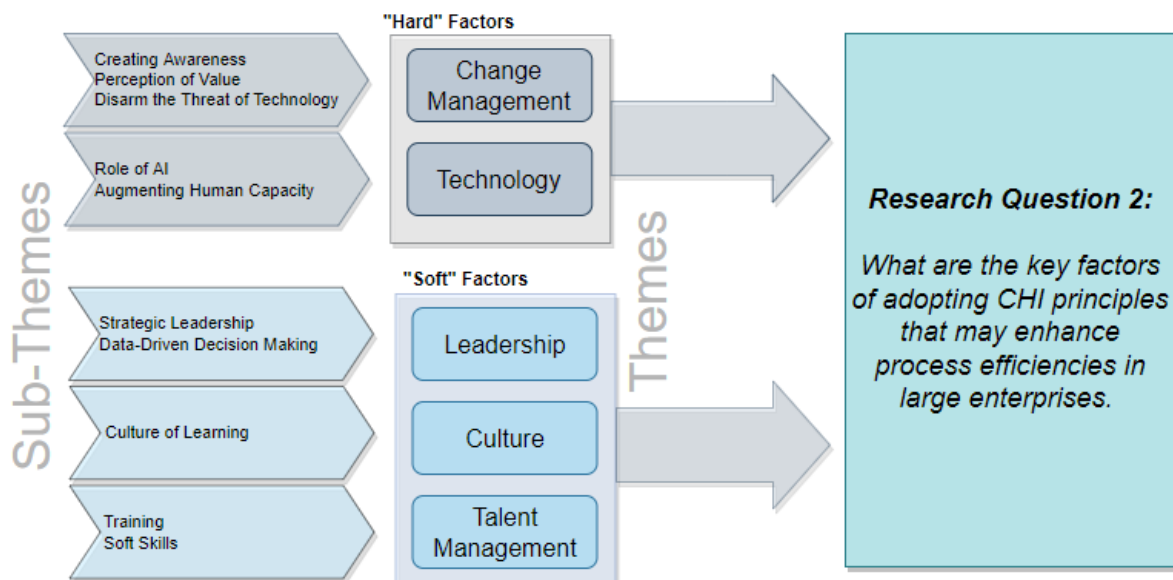


Figure 3 - CHI factors enhancing process efficiencies

CHAPTER 6 - DISCUSSION OF FINDINGS

5.1 INTRODUCTION

Chapter 6 presents a detailed discussion of the results from the analysis of thirteen semi-structured interviews presented in Chapter five. The discussion is grounded on the literature review presented in Chapter two, the research questions posed in Chapter three, and the findings presented in Chapter five and provides insights on the factors of CHI adoption that can enhance corporate innovation or process efficiencies in large organisations. The insights presented in this chapter aim to contribute to the existing literature on CHI by presenting fresh findings that fill gaps in the existing knowledge. Comparisons and contrasts will be made between the findings and existing literature, with differences highlighted in the discussion. The study will contribute new findings to the existing literature in the field of collective hybrid intelligence where they have not already been addressed.

5.2 COMMON “SOFT” THEMES FOR RESEARCH QUESTIONS ONE AND TWO

5.2.1 Theme 1 – Talent Management

As part of the research findings, interview participants suggested that training, soft skills, analytical skills and people retention are key factors to consider when adopting HCI principles to enhance corporate innovation. The majority of participants emphasised the significance of training to maintain the relevance of employee skills and prevent technological displacement during digital transformation and innovation, which is in line with existing literature (Chauhan et al., 2021). Literature indicates that AI adoption exposes businesses to matters such as increased workforce training needs, change management, and the expiration of their current business models (Chauhan et al., 2021). If the future of work implies constant transformation, triggering a requirement for lifelong learning, then the emphasis on talent management becomes increasingly important in the research on CHI adoption and its effects on corporate innovation (van Hoek et al., 2020).

5.2.1.1 Training

Literature reveals that AI will likely cause redundancy in lower-skilled jobs but will simultaneously cause countless new opportunities to be created (Brougham & Haar, 2018; Frey & Osborne, 2017). The adoption of AI will expose organisations to increased

workforce training and change management (Chauhan et al., 2021). This is in line with the research findings, which suggested that the changes in the business environment and organisational structure due to technological advancements will necessitate additional training for employees to remain relevant and to contribute to innovative practices. Therefore, workers must continuously prepare for the future of work by developing new skills that will be valuable for their careers regardless of their job type (Frank, Dalenogare & Ayala, 2019).

The findings suggest that a combination of upskilled employees and the capacity (sub-theme 6.3.3.1) created by the adoption of CHI principles creates a feasible platform for enhanced process efficiencies and corporate innovation within an organisation. Additionally, when this synergy between capacity and skill is combined with technology, it increases the likelihood of overlapping organisational roles, which allows for greater innovation but also necessitates additional training. As an example, it was revealed that low-code platforms could be used by business analysts to develop simple applications before handing them over to development teams to add complexity. Literature supports this finding and shows that the number of skills required per job has increased by 10% annually since 2017 due to constant technological innovation (Gupta, 2021), with an increasing requirement for constant skill renewing and the augmentation of jobs with AI capabilities (WEF, 2020). Since technological advancement is often disruptive and threatening to exist jobs, employees have to be proactive about learning and developing new skills in order to avoid being displaced.

5.2.1.2 Soft Skills

In line with research findings, the literature suggests that a strong foundation of soft skills from the human worker, such as critical thinking, collaboration, leadership, innovation and emotional intelligence, is required for an efficient human-computer symbiosis in organisations (Wilson & Daugherty, 2018). These skills enable workers to tackle complex business challenges and support innovation in the working environment. Knowledge and technology are ultimately created by human workers, which illustrates the importance and centrality of the human factor in the innovation process and, consequently, in innovation management (Kratzer, Meissner & Roud, 2017).

The research findings suggest that the need for soft skills will increase with technological advancements. As organisations adopt AI to augment workers and automate repetitive

and menial tasks, the need for emotional intelligence, collaboration and human-to-human interaction increases. Effective communication in the workplace fosters collaboration and allows for innovation to flourish in an organisation. Employees not using these skills effectively may result in reduced performance and hinder the organisation's ability to innovate (Wilson & Daugherty, 2018). Therefore, maintaining the development of soft skills is an appropriate strategy for companies to increase the innovativeness of their employees beyond contextual factors (Hendarman & Cantner, 2018).

5.2.1.3 Analytical Skills

The two prominent considerations regarding analytical skills involved data and the analysis thereof. The findings of this research highlight the importance of data, but even more so, the importance for organisations to possess the relevant skillsets to analyse the data for innovative decision-making. Existing works reveal that a company's ability to leverage data analytics can be a compelling dynamic capability (Ferraris et al., 2018; Wamba, 2017), emphasising the importance of data analytics in driving business innovation and competitive advantage (Teece, 2018; van Rijmenam et al., 2018).

Additionally, this research found that the importance of analytical roles like data engineering, data scientist and similar data analysis skills for innovation in organisations cannot be underestimated. Therefore, it is crucial for organisations to invest in training employees and to develop dedicated programs to support the growth and development of these skills across all levels of the organisation. Respondents felt that organisations must invest in the development of data engineering talent and cultivate an analytical mindset within their workforce to ensure that these critical skill sets are consistently available to enable the successful implementation of digital initiatives and create data-driven innovations. Fountaine, McCarthy and Saleh (2019) agree with this finding and highlight the importance of honing the hard and soft skills of data architects, data engineers, data scientists and any employees responsible for AI solution development, data governance and data analytics.

By investing in the development of their human capital and creating opportunities to develop analytical skills within the organisation, organisations will be better equipped to meet the increasing challenges of the digital age and develop a competitive advantage over their competitors (van Rijmenam et al., 2018). This finding correlates with literature highlighting the importance for workers to nurture analytical skills to build on the intuitive

capabilities that give them the decision-making advantage over AI (Jarrahi, 2018). As the amount of data available to businesses continues to grow at a rapid pace, organisations will increasingly need individuals with deep analytical expertise to extract value from this data and use it to inform key decisions around corporate innovation.

Specialised skills are intrinsically linked to training, discussed in sub-theme 6.2.2.1. Although sometimes it is necessary to bring in new talent possessing the requisite level of cognitive reasoning and analytical skills, in most cases, it is more beneficial to retrain and upskill existing staff (Jarrahi, Askay, Eshraghi & Smith, 2022). Not only will this result in employees with better data and technology skills upskilling will also give them the ability to frame business problems in a way that allows them to determine which innovative processes or technologies are most appropriate to address them (Davenport & Mahidhar, 2018).

5.2.1.4 Morale

When participants were asked about the sentiment of employees towards collaborating with AI technologies, words like “threatened”, “concern”, “resistance”, “fear”, and “negative impact” was constant theme. Findings included that employees are threatened by the possibility that AI and RPA technologies will replace their roles, alter their roles, or create a need for continuous upskilling. Participants noted that these threats create a fear of the technologies, which can result in resistance from employees to adopt them.

Participant 8: “how do we get people past that fear and have them just embrace technology?”

This initial finding related to a fear of being replaced by AI is consistent with other studies on the adoption of AI technologies, raising concerns about AI and robotics displacing people from their jobs and affecting their livelihoods (McGuinness, Pouliakas & Redmond, 2021). Frey and Osborne (2017) argue that this fear is grounded in facts and that more than half of all roles in developed economies are susceptible to technological displacement. While Arntz, Gregory and Zierahn (2017) agree that the possibility exists, they believe that the likelihood of displacement is significant. Recent research on the topic suggested that skills-displacing technology primarily affects higher-skilled workers (McGuinness, Pouliakas & Redmond, 2021), which is in contradiction to the original notion

that AI and automation would primarily affect lower-skilled employees (Brougham & Haar, 2018; Frey & Osborne, 2017)

Further findings revealed resistance from employees towards constant changes to their work environment and the upskilling that it may require. Literature confirms the correlation between innovative technologies, collaborative processes and a significant need for employee upskilling and reskilling to remain relevant (Frank, Dalenogare & Ayala, 2019). This finding is aligned with previous research, confirming that a combination of environmental changes, continuous training, and a fear of displacement results in resistance towards the adoption from employees (Fountain, McCarthy & Saleh, 2019; Kolbjørnsrud, Amico & Thomas, 2017).

5.2.2 Theme 2 - Leadership

5.2.2.1 Strategic Leadership

A key challenge associated with adopting emerging technologies such as AI is organisational resistance to change. Managers often resist implementing new processes and technologies because they see them as a threat to their positions of power and control within the organisation. Consequently, these managers are sceptical about the benefits of adopting new technologies or innovative ways of working and are unwilling to change their behaviours or work practices to accommodate them.

The findings that relate to the strategic leadership sub-theme are two-fold. The first finding discusses the traits required by a leader to enhance efficiencies and promote innovation amongst his or her followers, while the second finding discusses the role of a strategic, innovative leader in corporate innovation.

Aligned with existing literature, this research found that a leader should be open and vulnerable to accept new ideas and acknowledge individuals for their innovative ideas to promote innovation among his followers (Cimini, Boffelli, Lagorio, Kalchschmidt & Pinto, 2020; Kremer, Villamor & Aguinis, 2019). Participant 8 used an example of a corporate innovation week winner who left the company after receiving a monetary reward but not getting acknowledgement from the management of his innovation and highlighted the importance of acknowledgement.

Extensive literature exists on the value of employee acknowledgement and emphasises the value of acknowledgement at all levels of an organisation (Fountaine, McCarthy & Saleh, 2019; Kremer, Villamor & Aguinis, 2019). It is also argued in the literature that a leader can take advantage of the power of strategic acknowledgement to create an environment that encourages innovation among employees (Kremer, Villamor & Aguinis, 2019). The research data suggests a culture of acknowledgement among leaders to promote the adoption of innovative technologies and, therefore, CHI principles to enhance corporate innovation.

Additionally, the research indicated that leaders should champion innovation and ensure the availability of an appropriate technological landscape that encourages innovative thinking. The data points out that strategic leaders should not force the adoption of innovative AI onto peers but rather promote its value to other business leaders. This is aligned with the definition of strategic leadership, which describes it as the process of influencing strategic change (Samimi, Cortes, Anderson & Herrmann, 2020). Since CHI relies heavily on human acceptance, the strategic leader's influence is crucial to adopting CHI principles and, even more so, to facilitating innovative organisational change. For this reason, leadership capability is of key importance in fostering a culture of innovation in the organisation (Palladan, Abdul Kadir & Yen, 2016). Similarly, Cummings and Knot (2018) highlight the importance of leadership in driving innovation by pointing out that the value of an innovation is often dependent on its introduction to the environment.

The need for leaders to encourage and promote innovations within the organisation cannot be overstated (Cummings & Knot, 2018; Tabesh, Vera, & Keller, 2019). Leaders must ensure that employees have the necessary resources to develop innovative solutions to complex business problems (Caputo, Cillo, Candelo & Liu, 2019). They must create an environment that encourages creativity and experimentation (Saviano, Caputo, Mueller & Belyaeva, 2018) and develop the necessary skills to lead innovative initiatives and manage creative teams (Scuotto, Santoro, Bresciani & Del Giudice, 2017).

In conclusion, strong leadership capabilities and competencies are essential in ensuring that an organisation is able to fully benefit from the advantages of CHI. Leaders with innovative leadership skills can influence innovative activities in organisations and

motivate adoption and technological trust among the workforce. It is, therefore, vital for organisations to employ strategic and innovative leaders to ensure the effective adoption of CHI principles to enhance innovation in an organisation.

5.2.2.2 Change Agent

There is no doubt that technological advances play a critical role in the corporate world, as they offer new ways to conduct business, interact with customers and partners, and generate new revenue streams, but the question remains regarding who should be responsible for exploitation and exploration of innovative products and technologies (Samimi, Cortes, Anderson & Herrmann, 2020).

To be a successful change agent, a person must be able to identify the need for change and to be able to formulate a plan to achieve it (Rosenbaum, More & Steane, 2018). This implies the change agent is highly competent and experienced, with a comprehensive understanding of the organisation's culture and strategy, as well as an awareness of how proposed changes will impact the organisation as a whole.

The role of the change agent is to bridge the gap between technical and non-technical teams so that the planned changes can be implemented successfully (Maier & Brem, 2018). Interview data suggests that the change agent should be at the executive or even board level. Some suggestions for change agents included Chief Digital Officer, Chief Technology Officer, Chief Digital Officer and Chief Artificial Intelligence Officer. The interview data also provided qualities and skills that were considered important for this role, which include communication skills, strong business acumen, strategic vision, and the ability to build trust across the organisation. It was also considered vital by most interviewees for the change agent to consist of an in-depth understanding of the technology landscape and be able to keep up with the rapidly changing technologies. This indicates the requirement for a CHI change agent to have a strong technological background and remain up to date regarding the latest technological developments and be able to use this knowledge to identify new opportunities and new challenges for the organisations (Maier & Brem, 2018; Sim, Griffin, Price & Vojak, 2007).

Furthermore, the interview findings revealed that innovation should not belong to a single person or area and that it should be embedded in the culture of the organisation. However, innovation should be managed by a change agent to ensure the analysis and implementation of innovations in a structured and uniform manner.

5.2.2.3 Data-Driven Decision-Making

In the present day, organisations are becoming increasingly reliant on data-driven decision-making to improve their performance (Bertsimas & Kallus, 2020; Raisch & Krakowski, 2020). Building on the findings in data and analytics in section (6.3.2.1), the research added additional insights, highlighting the importance of trustable data that enable leaders to make informed decisions. Yablonsky (2019) argues that AI gains usefulness when it improves leader decision-making by combining advanced analytics and big data with an element of human interaction through a digital platform. However, in agreement with the extant literature, the researchers noted that data without context does not provide actionable insights (Glikson & Woolley, 2020). It is, therefore, vital for organisational data to be accurate and trustworthy. Without accurate data on the company's state, leaders have no place to start charting a new course (Jesse, 2018).

Being able to access rich data from a variety of sources allows managers to make accurate real-time forecasts about their organisation's future, which in turn helps them to develop more effective strategies for achieving their goals (Kolbjørnsrud, Amico & Thomas, 2017). The ability to integrate both big data analytics and human insight can also improve the innovative possibilities and efficiencies of a workforce by helping employees make more informed decisions about the projects that they are working on.

5.2.3 Theme 3 – Culture

5.2.3.1 Innovative Culture

This study emphasised the strong correlation between culture and innovation in an organisation. Research findings indicated that companies with innovation in their DNA find it easier to innovate on both the business and technological fronts. The literature suggests that organisations can better implement their innovation strategies and achieve superior innovation performance by integrating their shared values and cultural norms with the strategic requirements (Chen, Huang, Liu, Min, & Zhou, 2018). This suggests the importance of the fit between culture and innovation strategy for effective implementation of the innovation strategy (Yarbrough, Morgan & Vorhies, 2011).

5.2.3.2 Learning Culture

Literature reveals that AI will likely cause redundancy in lower-skilled jobs but will simultaneously cause countless new opportunities to be created (Brougham & Haar, 2018; Frey & Osborne, 2017). The adoption of AI will expose organisations to increased workforce training and change management (Chauhan et al., 2021). This is in line with the research findings, which suggested that the changes in the business environment and organisational structure due to technological advancements will necessitate additional training for employees to remain relevant and to contribute to innovative practices. Therefore, workers must continuously prepare for the future of work by developing new skills that will be valuable for their careers regardless of their job type (Frank, Dalenogare & Ayala, 2019). The findings suggest that a combination of upskilled employees and the capacity (sub-theme 6.3.3.1) created by the adoption of CHI principles creates a feasible platform for enhanced process efficiencies and corporate innovation within an organisation. Additionally, when this synergy between capacity and skill is combined with technology, it increases the likelihood of overlapping organisational roles, which allows for greater innovation but also necessitates additional training. Since technological advancement is often disruptive and threatening to exist jobs, employees have to be proactive about learning and developing new skills in order to avoid being displaced.

5.3 COMMON “HARD” THEMES FOR RESEARCH QUESTION ONE AND TWO

5.3.1 Theme 4 – Change Management

Effective change management should include strategies such as employee communication, training, and support from leadership to facilitate acceptance (Rosenbaum, More & Steane, 2018). As discussed in section (6.2.1.4), the research findings indicated that employees are concerned about AI technologies replacing them, which could lead to resistance from their end. To effectively facilitate the transformation towards a CHI model, participants suggested the implementation of appropriate change management to acknowledge and address employee concerns. In this sense, change management could be utilized to identify the need for change before aligning the culture, structures, and processes with the organization’s strategic goals (Moran & Brightman, 2001; Rosenbaum, More & Steane, 2018).

5.3.1.1 Creating Awareness

Following section (6.2.1.4), the research findings suggested the implementation of change management, communication, early adopters, and training programs to create awareness amongst employees of the benefits of AI technologies and therefore build user trust that the technologies are implemented to augment and help them and not to replace them. Fountaine, McCarthy and Saleh (2019) confirmed the need to build confidence in employees that AI will enhance their skills rather than replace them. Furthermore, existing literature suggests the inclusion of employees during the early stages of the design and implementation phases to make them accustomed to the change and create a sense of ownership to ease the transition into the change management phase (Gupta, Kumar, Singh, Foropon, & Chandra, 2018).

Participant seven mentioned the importance of “talking to the heart of the employee” and communicating the benefits of adoption to them and to the organization. This recommendation is consistent with the findings discussed in section (6.2.2.1) on the positive effects of leader communication and engagement regarding the adoption of new processes, products or technologies. Fountaine, McCarthy and Saleh (2019) suggest that a compelling story can facilitate employees to appreciate the urgency of the change initiative and understand how it will benefit them. As discussed in section (6.2.1.1) employee training programs should be developed to address these issues and provide employees and leaders with the information they need to address any potential concerns related to adoption (Fountaine, McCarthy & Saleh, 2019).

5.3.1.2 Perception of Value

Participant eight stated that “Nobody teaches anybody how to use Whatsapp.” This comment lays the foundation for this sub-theme and refers to the fact that people make an effort to learn a technology if they see a benefit in it. It is, therefore, imperative for leaders to communicate the benefits of innovations to the users. Extant literature highlights that the inclusion of employees during the implementation phase is an efficient method to communicate the benefits of innovation or change to the users (Gupta, Kumar, Singh, Foropon, & Chandra, 2018). Additional methods to communicate the benefits to employees were explained in earlier findings and included training, discussed in section (6.2.1.1) and the change management awareness discussed in section (6.3.1.1).

5.3.1.3 Disarm the Threat of Technology

Building on the discussion of the morale of staff in section (6.2.1.4) which relates to the fear of employees seeing AI and RPA technologies as a threat to their livelihoods. This finding is consistent with other studies on the adoption of AI technologies, raising concerns about AI and RPA displacing people from their jobs and affecting their livelihoods (McGuinness, Pouliakas & Redmond, 2021). Research data suggests that the fear of technologies can be mitigated through training (section 6.2.1.1), change management (section 6.3.1), creating awareness (section 6.3.1.1) or by showing the employee the value of the technology (section 6.3.1.3). The fear of AI and RPA was a continuous theme ranging over the majority of interviews and affects the adoption of CHI principles, corporate innovation as well as process efficiencies in organizations.

5.3.2 Theme 5 – Technology

5.3.2.1 Data and Analytics

Research findings highlight the importance of data and data analytics to the continued success of organizations and highlight some key challenges related to the use of data and data analytics for innovation in the context of CHI. As organizations move towards the adoption of CHI principles, the need for data and analytics to support decision-making processes becomes more significant as organizations find themselves in an environment in which human judgement increasingly needs to be supported by AI algorithms that have access to vast amounts of data and can analyze the insights to provide real-time recommendations (Choudhury, Starr & Agarwal, 2020). The research finding and extant literature indicates a correlation between analytics and Analytical Skills (section 6.2.1.3)

As organizations transform themselves into digital enterprises and seek to exploit new digital technologies to achieve their strategic objectives, the leadership challenge has become how to harness the power of data to drive innovation and create value for their organization (Lindebaum, Vesa & Den Hond, 2020; Wamba, 2017). Technological advancements such as the IoT and the rise of AI have created endless opportunities for organizations to enhance their innovative decision-making process using data and analytics (Duan, Edwards & Dwivedi, 2019; Dwivedi et al., 2021).

The adoption of CHI will create numerous challenges for managers as they face an increasingly competitive environment in which they must determine the most effective ways of using data and analytics to gain a competitive advantage and improve their

decision-making capabilities (Caputo, Cillo, Candelo & Liu, 2019). At the same time, both literature and research findings indicate that leaders need to be aware of ethical issues that arise with the use of data and data analytics to ensure that they do not inadvertently discriminate against certain groups of people or infringe upon individual privacy (Some, Davern, Breidbach & Shanks, 2019). The transition towards digitization and the adoption of CHI principles requires enterprises to alter their view of data analytics (Yablonsky, 2019).

5.3.2.2 Emerging Technologies

RPA and AI are the two technologies that were most mentioned by participants during the interview process. They are two of the most transformative technologies that businesses can adopt in order to create increased efficiency and innovation in their organizations (Duan, Edwards & Dwivedi, 2019; Dwivedi et al., 2021). RPA is software that can automate repetitive tasks, such as data entry and processing, freeing up employees for more valuable work (Van der Aalst, Bichler & Heinzl, 2018). AI uses machine learning to automate certain processes through sophisticated algorithms, creating efficiencies and allowing companies to scale up operations while reducing costs at the same time (Dwivedi et al., 2021). Both technologies were highlighted in the research findings for their notable potential to transform business operations, making them more efficient, streamlined and cost-effective. Participants elaborated on their experiences with RPA and AI and noted a concern among employees regarding technological displacement. However, as discussed in section (6.3.1.2), this fear can be overcome by including them early in the change management process to ensure their familiarity with the technology. Conversely, participant thirteen argued that the adoption of AI technologies would increase the competitiveness of an organization, attracting more customers and effectively countering the effects of technological displacement.

A few participants raised additional concerns about the future of employment in the event of technological singularity, while others contest the possibility of it happening. Singularity refers to the point where AI surpasses all human intellectual activities (Upchurch, 2018; Good, 1966).

For organizations starting the digital transformation journey, research findings and existing literature agree that the most important steps to take involve identifying areas where automation will have the greatest impact (Wamba, 2017) and determining the strategy and

implementation plan required to achieve the desired results (Liboni et al., 2019). The participants elaborated further on adoption strategies and suggested that organizations start small in order to implement RPA and AI in a way that maximizes the benefits to the organization and scales up once the benefits are realized.

The findings suggest that one of the key steps that any business should take towards enhancing innovation and efficiencies is creating capacity for it within the organization. This means that the company must be willing to invest time and resources into cultivating an innovative culture, adopting innovative technologies and encouraging employees to engage in innovation. Extant literature reveals that human capacity can be created through effective AI implementation (Wilson & Daugherty, 2018).

CHAPTER 7 - CONCLUSION AND RECOMMENDATIONS

6.1 INTRODUCTION

The purpose of this study was to gain insight into the perceptions of senior managers and executives on CHI. It sought to explore their views on how the adoption of CHI could enhance corporate innovation and process efficiencies. The aim of the study was to identify key factors of CHI that have a direct affect on the enhancement of innovation and efficiencies in an large organisation. Owing to widespread concern regarding the impact of emerging technologies like AI and RPA on organisational competitiveness and technological unemployment, this study was conducted to determine potential implications for both employees and organisations in the highly competitive financial and insurance sectors and to establish the most effective way to create symbiosis between human and artificial intelligence.

Chapter seven concludes this study by presenting a summary of the key findings, followed by the managerial implications, the study limitations and lastly, the recommendations for future research. The literature presents a relatively new conceptual model for CHI (Moradi, Moradi, Bayat, & Toosi, 2019), and this study offers further context to the conceptual model by discussing the factors CHI factors that enhance corporate innovation and process efficiencies.

6.2 CONCLUSION OF RESEARCH FINDINGS

This research paper addresses the two research questions posed in the study by means of an exploratory study. It was discovered that senior and executive management in the financial and insurance sectors share similar perspectives on the CHI factors that impact corporate innovation and process efficiencies.

This section outlines the current context in which businesses are operating, followed by a conclusion for each research question and an attempt to develop a conceptual framework that will aid in organising and communicating the study's primary topics. The research questions are addressed concurrently as the study discovered a strong correlation between process efficiencies and corporate innovation, with the same themes influencing both constructs.

6.2.1 Research Questions

RQ1 - What are the key factors of adopting CHI principles that may enhance corporate innovation in large enterprises?

RQ2 - What are the key factors of adopting CHI principles that may enhance process efficiencies within large enterprises?

The research questions seek to establish the critical factors related to the adoption of CHI principles that may encourage and improve corporate innovation and process efficiencies in large enterprises. The question will be analysed in two parts by using the “hard” and “soft” factors of McKinsey’s 7S model for organisational change management (Waterman et al., 1980).

Ranking	7S Factor	Theme	Number of Participants	Sub-Theme
1	Soft	Talent Management	9	Training Soft Skills Analytical Skills Morale
2	Soft	Leadership	8	Strategic Leadership Change Agent
3	Soft	Culture	8	Innovative Culture
4	Hard	Change Management	7	Change Management
5	Hard	Technology	8	Data and Analytics Emerging Technologies Augmenting Human Capacity

Table 3 - Themes related to Corporate Innovation

Ranking	Factor	Theme	Number of Participants	Subtheme
1	Soft	Talent Management	11	Training Skills
2	Soft	Leadership	8	Strategic Leadership Data-Driven Decision Making
3	Soft	Culture	5	Learning Culture
4	Hard	Change Management	8	Creating Awareness Perception of Value Disarm the Threat of Technology
5	Hard	Technology	10	Role of AI Augmenting Human Capacity

Table 4 - Themes related to Process Efficiencies

6.2.2 “Soft” Themes for Research Question One and Two

6.2.2.1 Theme 1 – Talent Management

The study found that the key factors linked to talent management include training, soft skills, analytical skills and employee morale. It highlighted a continuous need for training and reskilling due to the fast pace of technological advancements. Literature indicates that AI adoption exposes businesses to matters such as increased workforce training needs, change management, and the expiration of their current business models (Chauhan et al., 2021). However, the continuous training results in higher-skilled employees and, combined with the capacity created by the adoption of CHI principles, results in a feasible platform for innovation and improvement. Additionally, when this cooperation between capacity and skill is combined with technology, it increases the likelihood of overlapping organisational roles, which allows for even greater innovation but also necessitates additional training. The phenomenon created by the combination of increased capacity, continuous training and technologies results in both an increase in corporate innovation and process efficiencies and therefore contributes to the existing literature on both fronts.

Research findings highlight an increased need for skills due to technological advancements. As organisations adopt AI to augment workers and automate repetitive and menial tasks, the need for emotional intelligence, collaboration and human-to-human interaction increases. In line with research findings, the literature suggests that a strong foundation of soft skills from the human worker, such as critical thinking, collaboration, leadership, innovation and emotional intelligence, is required for an efficient human-computer symbiosis in organisations (Wilson & Daugherty, 2018).

Additionally, this research pointed out the growing importance of analytical roles like data engineering, data scientist and similar data analysis skills for innovation in organisations. Respondents felt that organisations must invest in the development of data engineering talent and cultivate an analytical mindset within their workforce to ensure that these critical skill sets are consistently available to enable the successful implementation of digital initiatives and create data-driven innovations. This finding was concurred by literature which highlights the importance of honing the hard and soft skills of data architects, data engineers, data scientists and any employees responsible for AI solution development, data governance and data analytics.

6.2.2.2 Theme 2 – Leadership

Aligned with existing literature, the research found that a leader should be open and vulnerable to accept new ideas and acknowledge individuals for their innovative ideas to promote innovation among his followers (Cimini, Boffelli, Lagorio, Kalchschmidt & Pinto, 2020; Kremer, Villamor & Aguinis, 2019). The importance of acknowledgement was brought up by a number of participants and is echoed by the extensive literature on the topic (Fontaine, McCarthy & Saleh, 2019; Kremer, Villamor & Aguinis, 2019). The research data points out a possibility for leaders to use open acknowledgement as a tool to promote innovation and enhanced efficiencies.

Additionally, the research points out that leaders should champion innovation and ensure the availability of an appropriate technological landscape that encourages innovative thinking but should not force the adoption of innovative AI onto peers. Leaders would enjoy greater success by promoting its value to other business leaders. This is aligned with the definition of strategic leadership, which describes it as the process of influencing strategic change (Samimi, Cortes, Anderson & Herrmann, 2020).

Since CHI relies heavily on human acceptance, the strategic leader's influence is crucial to the adoption of CHI principles and even more so in the facilitation of innovative organisational change. For this reason, leadership capability is of key importance in fostering a culture of innovation in the organisation (Palladan, Abdul Kadir & Yen, 2016).

The research highlights the importance of trustable data that enable leaders to make informed decisions to improve efficiencies. Yablonsky (2019) argues that AI gains usefulness when it improves leader decision-making by combining advanced analytics and big data with an element of human interaction through a digital platform. Literature notes that a lack of accurate data on the company's state leaders has no place to start charting a new course (Jesse, 2018).

In conclusion, strong leadership capabilities and competencies are essential in ensuring that an organisation is able to fully benefit from the advantages of CHI.

Being able to access rich data from a variety of sources allows managers to make accurate real-time forecasts about their organisation's future, which in turn helps them to develop more effective strategies for achieving their goals (Kolbjørnsrud, Amico &

Thomas, 2017). The ability to integrate both big data analytics and human insight can improve the innovative possibilities and efficiencies of a workforce by helping employees make informed decisions about the projects that they are working on.

6.2.2.3 Theme 3 – Culture

The findings suggests that culture is in the centre of innovation and process efficiencies. Organisations requires both a culture of innovation and a learning culture to remain relevant. The adoption of AI will expose organisations to increased workforce training and change management (Chauhan et al., 2021). This is in line with the research findings, which suggested that the changes in the business environment and organisational structure due to technological advancements will necessitate additional training for employees to remain relevant and to contribute to innovative practices. Therefore, workers must continuously prepare for the future of work by developing new skills that will be valuable for their careers regardless of their job type (Frank, Dalenogare & Ayala, 2019). The findings suggest that a combination of upskilled employees and the capacity created by the adoption of CHI principles creates a feasible platform for enhanced process efficiencies and corporate innovation within an organisation. Additionally, when this synergy between capacity and skill is combined with technology, it increases the likelihood of overlapping organisational roles, which allows for greater innovation but also necessitates additional training.

Since technological advancement is often disruptive and threatening to exist jobs, employees have to be proactive about learning and developing new skills in order to avoid being displaced. This study emphasised the strong correlation between culture and innovation in an organisation. Research findings indicated that companies with innovation in their DNA find it easier to innovate on both the business and technological fronts. The literature suggests that organisations can better implement their innovation strategies and achieve superior innovation performance by integrating their shared values and cultural norms with the strategic requirements (Chen, Huang, Liu, Min, & Zhou, 2018). This suggests the importance of the fit between culture and innovation strategy for effective implementation of the innovation strategy (Yarbrough, Morgan & Vorhies, 2011).

6.2.3 “Hard” Themes for Research Question One and Two

6.2.3.1 Theme 4 – Change Management

Findings on the theme of change management included the fact that employees are threatened by the possibility that AI and RPA technologies will replace their roles, alter their roles, or create a need for continuous upskilling. Participants noted that these threats create fear amongst employees, which can result in resistance from employees to adopt them. The interview participants suggested the implementation of change management and training programs to create awareness amongst employees of the benefits of AI technologies and therefore build user trust that the technologies are implemented to augment and help them and not to replace them. Fountaine, McCarthy and Saleh (2019) confirmed the need to build confidence in employees that AI will enhance their skills rather than replace them.

Findings suggest that change management can be done in the form of training, communication, early adopters, or involving employees in the implementation process. These research findings are aligned with existing literature which suggests the inclusion of employees during the early stages of the design and implementation phases to make them accustomed to the change and create a sense of ownership to ease the transition into the change management phase (Gupta, Kumar, Singh, Foropon, & Chandra, 2018).

6.2.3.2 Theme 5 – Technology

Research findings highlight the significant importance of data and data analytics and link it to the continued success of organisations. As organisations move towards the adoption of CHI principles, the need for data and analytics to support decision-making processes becomes more significant as organisations find themselves in an environment in which human judgement increasingly needs to be supported by AI algorithms that have access to vast amounts of data and can analyse the insights to provide real-time recommendations (Choudhury, Starr & Agarwal, 2020). Other than data, RPA and AI are the two technologies most mentioned by participants during the interview process. They are known as two of the most transformative technologies that businesses can adopt in order to create increased efficiency and innovation in their organisations (Duan, Edwards

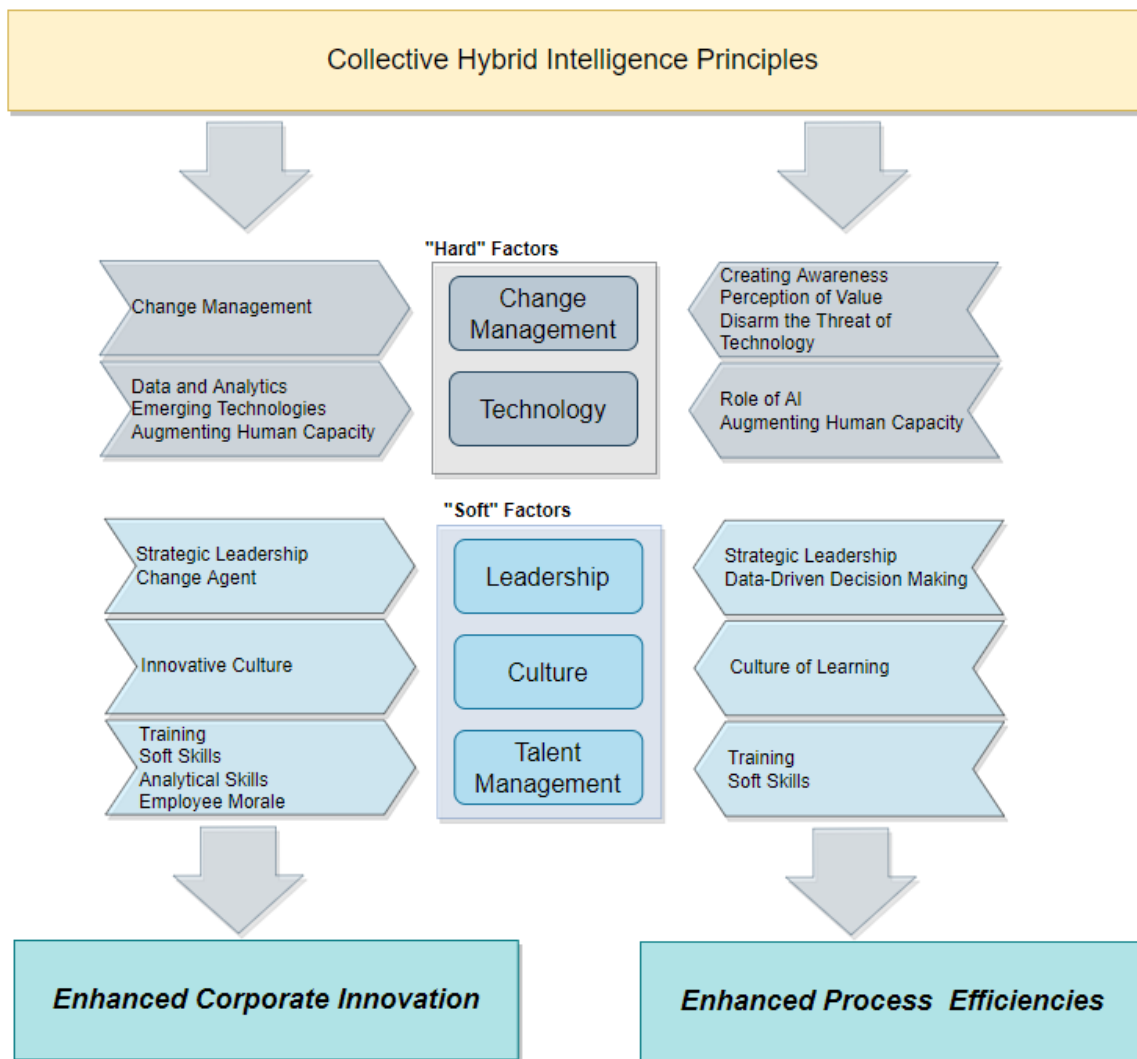
& Dwivedi, 2019; Dwivedi et al., 2021). Both technologies were highlighted in the research findings for their notable potential to transform business operations, making them more efficient, streamlined and cost-effective. Participants elaborated on their experiences with RPA and AI and noted a concern among employees regarding technological displacement. However, as previously noted, this fear can be mitigated by including them early in the change management process to ensure their familiarity with the technology.

A new viewpoint was raised that the adoption of AI technologies will increase the overall competitiveness of an organisation, attracting more customers and effectively countering the effects of technological displacement. This viewpoint was not covered in the literature reviewed by the author and can therefore be added to the body of knowledge.

The participants elaborated further on AI and RPA adoption strategies and suggested that organisations start small in order to implement RPA and AI in a way that maximises the benefits to the organisation and scales up once the benefits have been realised.

The findings suggest that one of the key steps that any business should take towards enhancing innovation and efficiency is creating capacity for it within the organisation. This means that the company must be willing to invest time and resources into cultivating an innovative culture, adopting innovative technologies and encouraging employees to engage in innovation. Human capacity can be created by adopting CHI principles in organisations. (Wilson & Daugherty, 2018).

6.3 PROPOSED MODEL



6.4 APPLICATION OF THE FRAMEWORK

Numerous crucial factors were outlined in the model for leaders attempting to implement CHI principles in order to enhance process efficiencies and corporate innovation. From the perspective of corporate innovation and process efficiencies, the framework demonstrates the factors for the adoption of CHI and summarises the factors and subfactors that could enhance process efficiencies and corporate innovation. These prerequisite sub-factors are vital, and all play a significant role in the outcome of CHI adoption. Business leaders can take advantage of this framework to drive innovation and efficiency through the adoption of any of the concepts related to CHI, including Human Intelligence, Hybrid Intelligence or Collective Intelligence.

6.5 IMPLICATIONS FOR STAKEHOLDERS

This research provides insights into the elements of CHI that influence corporate innovation and process efficiencies. The key findings suggest that CHI can lead to increased efficiencies, creativity, better problem solving, decision making and corporate innovation. These findings suggest that organisations should explore efficient ways to incorporate collective intelligence into their work in order to increase efficiency and improve innovation processes. To remain competitive in a highly competitive landscape, organisations must be innovative, embrace new technologies and employ new strategies to ensure their continued relevance. The findings suggest that employee time saved due to automation should be utilised core renewed corporate innovation.

Increased efficiencies as a result of CHI adoption would increase make the organisation more competitive and attract new customers, which would likely offset technological displacement of employees. The findings of this study increases the urgency for corporations to explore and implement new technological solutions that enable their employees to harness the power of collective intelligence and achieve their business objectives more effectively.

6.6 RESEARCH LIMITATIONS

Due to the exploratory nature of this study, the findings cannot be broadly generalised and are limited in their application. The study was conducted with a small population of senior and executive managers and subject matter experts in the financial and insurance sectors within South Africa, which is a further limitation of the study. Although saturation was reached by interview number eleven, the limited number of thirteen interviews is not a sufficient representation of all financial or insurance institutions.

All interviews were conducted through the online Microsoft Teams platform, which limits the ability of the interviewer to collect data points on body language. Additionally, load shedding and general bandwidth problems caused delays and frustration in some interviews may have resulted in a reduced level of participation and detail from participants. Most interviews were conducted during working hours, which resulted in brief interruptions from co-workers in some cases.

Importantly, the opinions expressed by the participants in this study do not represent the official stances of the organisations they own or work for, and consequently, no conclusions or inferences can be drawn regarding the strategic intention of organisations to adopt CHI principles.

Lastly, qualitative research can be subjective by design and can be influenced by the researcher's own preconceptions and biases, whether those biases are conscious or unconscious.

6.7 FUTURE DIRECTIONS

The results of this study were largely corroborated by existing literature. However, all newly found perspectives or insights present an opportunity for future research directions. This research finding suggests that the need for soft skills will increase with technological advancements. As organisations continue to adopt AI to augment workers and automate repetitive and menial tasks, the need for emotional intelligence, collaboration and human-to-human interaction increases. Effective communication in the workplace fosters collaboration and allows for innovation to flourish in an organisation. If employees are not using these skills effectively, it may result in reduced performance and hinder the organisation's ability to innovate (Wilson & Daugherty, 2018). Research exists on the impact of soft skills on the organisation's innovative ability and efficiencies, but there is no empirical research on the effect the continuous interaction with AI, RPA, and cognitive helpers has on human soft skills. Using the finding and framework of this study as a starting point, a similar study can be conducted using a similar financial industry approach. Additionally, the findings of this study can be used as a basis to research the impact of CHI on organisational competitive advantage and its correlation to employee needs.

REFERENCE LIST

- Acemoglu, D., & Restrepo, P. (2019). Automation and new tasks: How technology displaces and reinstates labour. *Journal of Economic Perspectives*, 33(2), 3-30.
- Adusei, M. (2016). Does entrepreneurship promote economic growth in Africa? *African Development Review*, 28(2), 201-214.
- Agostini, L., & Filippini, R. (2019). Organizational and managerial challenges in the path toward Industry 4.0. *European Journal of Innovation Management*.
- Alam, P. A. (2017). Measuring Organizational Effectiveness through Performance Management System and Mckinsey's 7 S Model. *Asian Journal of Management*, 8(4), 1280-1286.
- Armstrong, K., Parmelee, L., Santifort, S., Burley, J., & Van Fleet, J. W. (2018). Preparing tomorrow's workforce for the Fourth industrial revolution for business: A framework for action. *Deloitte & The Global Business Coalition for Education*.
- Armstrong, M. (2006). *A handbook of human resource management practice*. Kogan Page Publishers.
- Arntz, M., Gregory, T., & Zierahn, U. (2017). Revisiting the risk of automation. *Economics Letters*, 159, 157-160.
- Bellstam, G., Bhagat, S., & Cookson, J. A. (2021). A text-based analysis of corporate innovation. *Management Science*, 67(7), 4004-4031.
- Bertsimas, D., & Kallus, N. (2020). From predictive to prescriptive analytics. *Management Science*, 66(3), 1025-1044.
- Bhabha, H. (1984). Of mimicry and man: The ambivalence of colonial discourse. *October*, 28, 125-133.
- Bibby, L., & Dehe, B. (2018). Defining and assessing industry 4.0 maturity levels—case of the defence sector. *Production Planning & Control*, 29(12), 1030-1043.

- Bleicher, J., & Stanley, H. (2016). Digitisation as a catalyst for business model innovation. A three-step approach to facilitating economic success. *Journal of Business Management*, 5(2), 62-71.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.
- Brougham, D., & Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management & Organization*, 24(2), 239-257.
- Brynjolfsson, E., & McAfee, A. (2017). Artificial intelligence, for real. *Harvard business review*, 1, 1-31.
- Canhoto, A. I., & Clear, F. (2020). Artificial intelligence and machine learning as business tools: A framework for diagnosing value destruction potential. *Business Horizons*, 63(2), 183-193.
- Capurro, R., Fiorentino, R., Garzella, S., & Giudici, A. (2021). Big data analytics in innovation processes: which forms of dynamic capabilities should be developed and how to embrace digitization?. *European Journal of Innovation Management*.
- Caputo, F., Cillo, V., Candelo, E., & Liu, Y. (2019). Innovating through digital revolution: The role of soft skills and Big Data in increasing firm performance. *Management Decision*.
- CFI. (2022). McKinsey 7s model. Retrieved May 29, 2022, from <https://corporatefinanceinstitute.com/resources/knowledge/strategy/mckinsey-7s-model/>
- Channon, D. F., & Caldart, A. A. (2015). McKinsey 7S model. *Wiley encyclopedia of management*, 1-1.
- Chatterjee, S., Rana, N. P., Dwivedi, Y. K., & Baabdullah, A. M. (2021). Understanding AI adoption in manufacturing and production firms using an integrated TAM-TOE model. *Technological Forecasting and Social Change*, 170, 120880.

- Chauhan, C., Singh, A., & Luthra, S. (2021). Barriers to industry 4.0 adoption and its performance implications: An empirical investigation of emerging economy. *Journal of Cleaner Production*, 285, 124809.
- Chen, D. Q., Preston, D. S., & Swink, M. (2015). How the use of big data analytics affects value creation in supply chain management. *Journal of management information systems*, 32(4), 4-39.
- Chen, Z., Huang, S., Liu, C., Min, M., & Zhou, L. (2018). Fit between organizational culture and innovation strategy: Implications for innovation performance. *Sustainability*, 10(10), 3378.
- Chen, J., & Nadkarni, S. (2017). It's about time! CEOs' temporal dispositions, temporal leadership, and corporate entrepreneurship. *Administrative Science Quarterly*, 62(1), 31-66.
- Choudhury, P., Starr, E., & Agarwal, R. (2020). Machine learning and human capital complementarities: Experimental evidence on bias mitigation. *Strategic Management Journal*, 41(8), 1381-1411.
- Cimini, C., Boffelli, A., Lagorio, A., Kalchschmidt, M., & Pinto, R. (2020). How do industry 4.0 technologies influence organisational change? An empirical analysis of Italian SMEs. *Journal of Manufacturing Technology Management*.
- Cowan, N. (2015). George Miller's magical number of immediate memory in retrospect: Observations on the faltering progression of science. *Psychological review*, 122(3), 536.
- Cox, A. M., Pinfield, S., & Rutter, S. (2018). Extending McKinsey's 7S model to understand strategic alignment in academic libraries. *Library Management*.
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- Cummings, T., & Knott, A. M. (2018). Outside CEOs and innovation. *Strategic Management Journal*, 39(8), 2095-2119.

- Danquah, M., & Amankwah-Amoah, J. (2017). Assessing the relationships between human capital, innovation, and technology adoption: Evidence from sub-Saharan Africa. *Technological Forecasting and Social Change*, 122, 24-33.
<http://dx.doi.org/10.1016/j.techfore.2017.04.021>
- Davenport, T. (2016). *Rise of the strategy machines*. MIT Sloan Management Review.
- Davenport, T. H., & Mahidhar, V. (2018). What's your cognitive strategy. *MIT Sloan management review*, 59(4), 19-23.
- Dellermann, D., Ebel, P., Söllner, M., & Leimeister, J. M. (2019). Hybrid intelligence. *Business & Information Systems Engineering*, 61(5), 637-643.
- Deming, D. J., & Noray, K. (2020). Earnings dynamics, changing job skills, and STEM careers. *The Quarterly Journal of Economics*, 135(4), 1965-2005.
- Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data—evolution, challenges and research agenda. *International Journal of Information Management*, 48, 63-71.
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 101994.
- Eisenhardt, K. M., & Bingham, C. B. (2017). Superior strategy in entrepreneurial settings: Thinking, doing, and the logic of opportunity. *Strategy Science*, 2(4), 246-257.
- Fatorachian, H., & Kazemi, H. (2018). A critical investigation of Industry 4.0 in manufacturing: theoretical operationalisation framework. *Production Planning & Control*, 29(8), 633-644.
- Folds, D. J. (2016, October). Human executive control of autonomous systems: a conceptual framework. In *2016 IEEE International Symposium on Systems Engineering (ISSE)* (pp. 1-5). IEEE.

- Fountaine, T., McCarthy, B., & Saleh, T. (2019). Building the AI-powered organization. *Harvard Business Review*, 97(4), 62-73.
- Frank, A. G., Dalenogare, L. S., & Ayala, N. F. (2019). Industry 4.0 technologies: Implementation patterns in manufacturing companies. *International Journal of Production Economics*, 210, 15-26.
- Ferraris, A., Mazzoleni, A., Devalle, A., & Couturier, J. (2018). Big data analytics capabilities and knowledge management: impact on firm performance. *Management Decision*.
- Freeman, R. B., Ganguli, I., & Handel, M. J. (2020, May). Within-occupation changes dominate changes in what workers do: A shift-share decomposition, 2005–2015. In *AEA Papers and Proceedings* (Vol. 110, pp. 394-99).
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation?. *Technological forecasting and social change*, 114, 254-280.
- Frank, A. G., Dalenogare, L. S., & Ayala, N. F. (2019). Industry 4.0 technologies: Implementation patterns in manufacturing companies. *International Journal of Production Economics*, 210, 15-26. <https://doi.org/10.1016/j.ijpe.2019.01.004>
- Gardner, H. E. (2000). *Intelligence reframed: Multiple intelligences for the 21st century*. Hachette UK.
- Garud, R., Tuertscher, P., & Van de Ven, A. H. (2013). Perspectives on innovation processes. *Academy of Management Annals*, 7(1), 775-819.
- Gaur, A., & Kumar, M. (2018). A systematic approach to conducting review studies: An assessment of content analysis in 25 years of IB research. *Journal of World Business*, 53(2), 280-289.
- Ghasemaghaei, M., Ebrahimi, S., & Hassanein, K. (2018). Data analytics competency for improving firm decision making performance. *The Journal of Strategic Information Systems*, 27(1), 101-113.

- Ghobakhloo, M. (2018). The future of manufacturing industry: a strategic roadmap toward Industry 4.0. *Journal of Manufacturing Technology Management*.
- Ghobakhloo, M. (2020). Industry 4.0, digitization, and opportunities for sustainability. *Journal of cleaner production*, 252, 119869.
- Glikson, E., & Woolley, A. W. (2020). Human trust in artificial intelligence: Review of empirical research. *Academy of Management Annals*, 14(2), 627-660.
- Granville, V. (2014). *Developing analytic talent: Becoming a data scientist*. John Wiley & Sons.
- Good, I. J. (1966). Speculations concerning the first ultra intelligent machine. In *Advances in computers* (Vol. 6, pp. 31-88). Elsevier.
- Gruetzemacher, R., Paradice, D., & Lee, K. B. (2020). Forecasting extreme labor displacement: A survey of AI practitioners. *Technological Forecasting and Social Change*, 161, 120323.
- Gupta, A. (2021). Use a Digital Talent Management Framework to Future-Proof the IT Workforce. Retrieved May 24, 2022, from <https://www.gartner.com/smarterwithgartner/use-a-digital-talent-management-framework-to-future-proof-the-it-workforce>
- Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management*, 53(8), 1049-1064.
- Gupta, S., Kumar, S., Singh, S. K., Foropon, C., & Chandra, C. (2018). Role of cloud ERP on the performance of an organization: Contingent resource-based view perspective. *The International Journal of Logistics Management*.
- Guszcza, J., Lewis, H., & Evans-Greenwood, P. (2017). Cognitive collaboration: Why humans and computers think better together. *Deloitte Review*, 20, 8-29.
- Haenlein, M., Kaplan, A., Tan, C. W., & Zhang, P. (2019). Artificial intelligence (AI) and management analytics. *Journal of Management Analytics*, 6(4), 341-343.

- Hayes, J. (2022). *The theory and practice of change management*. Bloomsbury Publishing.
- Hendarman, A. F., & Cantner, U. (2018). Soft skills, hard skills, and individual innovativeness. *Eurasian Business Review*, 8(2), 139-169.
- Hoyer, C., Gunawan, I., & Reaiche, C. H. (2020). The implementation of industry 4.0—a systematic literature review of the key factors. *Systems Research and Behavioral Science*, 37(4), 557-578.
- Huang, M. H., & Rust, R. T. (2018). Artificial intelligence in service. *Journal of Service Research*, 21(2), 155-172.
- Huizingh, E. K. (2011). Open innovation: State of the art and future perspectives. *Technovation*, 31(1), 2-9.
- Iansiti, M., & Lakhani, K. R. (2020). *Competing in the age of AI: strategy and leadership when algorithms and networks run the world*. Harvard Business Press.
- Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business horizons*, 61(4), 577-586.
- Jarrahi, M. H. (2019). In the age of the smart artificial intelligence: AI's dual capacities for automating and informing work. *Business Information Review*, 36(4), 178-187.
- Jarrahi, M. H., Askay, D., Eshraghi, A., & Smith, P. (2022). Artificial intelligence and knowledge management: A partnership between human and AI. *Business Horizons*.
- Jesse, N. (2018). Organizational evolution-how digital disruption enforces organizational agility. *IFAC-PapersOnLine*, 51(30), 486-491.
- Jiang, R., Kleer, R., & Piller, F. T. (2017). Predicting the future of additive manufacturing: A Delphi study on economic and societal implications of 3D printing for 2030. *Technological Forecasting and Social Change*, 117, 84-97.
- Kamble, S. S., Gunasekaran, A., & Sharma, R. (2018). Analysis of the driving and dependence power of barriers to adopt industry 4.0 in Indian manufacturing industry. *Computers in Industry*, 101, 107-119.

- Kolbjørnsrud, V., Amico, R., & Thomas, R. J. (2017). Partnering with AI: how organizations can win over skeptical managers. *Strategy & Leadership*.
- Kong, D., Lin, C., Wei, L., & Zhang, J. (2022). Information accessibility and corporate innovation. *Management Science*.
- Kordzadeh, N., & Ghasemaghaei, M. (2022). Algorithmic bias: review, synthesis, and future research directions. *European Journal of Information Systems*, 31(3), 388-409.
- Koryak, O., Lockett, A., Hayton, J., Nicolaou, N., & Mole, K. (2018). Disentangling the antecedents of ambidexterity: Exploration and exploitation. *Research Policy*, 47(2), 413-427.
- Kotter, J. P. (2012). *Leading change*. Harvard business press.
- Kiss, A. N., Cortes, A. F., & Herrmann, P. (2022). CEO proactiveness, innovation, and firm performance. *The Leadership Quarterly*, 33(3), 101545.
- Kratzer, J., Meissner, D., & Roud, V. (2017). Open innovation and company culture: Internal openness makes the difference. *Technological Forecasting and Social Change*, 119, 128-138.
- Kremer, H., Villamor, I., & Aguinis, H. (2019). Innovation leadership: Best-practice recommendations for promoting employee creativity, voice, and knowledge sharing. *Business Horizons*, 62(1), 65-74.
- Kazancoglu, Y., & Ozkan-Ozen, Y. D. (2018). Analyzing Workforce 4.0 in the Fourth Industrial Revolution and proposing a road map from operations management perspective with fuzzy DEMATEL. *Journal of enterprise information management*.
- Knote, R., Janson, A., Söllner, M., & Leimeister, J. M. (2020). Value co-creation in smart services: a functional affordances perspective on smart personal assistants. *Journal of the Association for Information Systems*, 418-458.
- Lee, S. M., & Trimi, S. (2021). Convergence innovation in the digital age and in the COVID-19 pandemic crisis. *Journal of Business Research*, 123, 14-22.

- Lewin, K. (1947). Group decision and social change. *Readings in social psychology*, 3(1), 197-211.
- Liboni, L. B., Cezarino, L. O., Jabbour, C. J. C., Oliveira, B. G., & Stefanelli, N. O. (2019). Smart industry and the pathways to HRM 4.0: implications for SCM. *Supply Chain Management: An International Journal*.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. sage.
- Lindebaum, D., Vesa, M., & Den Hond, F. (2020). Insights from “the machine stops” to better understand rational assumptions in algorithmic decision making and its implications for organizations. *Academy of Management Review*, 45(1), 247-263.
- Lu, Y. (2017). Industry 4.0: A survey on technologies, applications and open research issues. *Journal of industrial information integration*, 6, 1-10.
- Lukoschek, C. S., Gerlach, G., Stock, R. M., & Xin, K. (2018). Leading to sustainable organizational unit performance: Antecedents and outcomes of executives' dual innovation leadership. *Journal of Business Research*, 91, 266-276.
- Maier, M. A., & Brem, A. (2018). What innovation managers really do: a multiple-case investigation into the informal role profiles of innovation managers. *Review of Managerial Science*, 12(4), 1055-1080.
- Makridakis, S. (2018). Forecasting the impact of artificial intelligence, part 3 of 4: The potential effects of AI on businesses, manufacturing, and commerce. *Foresight: The International Journal of Applied Forecasting*, (49), 18-27.
- Mansouri, A. A. A., Singh, S. K., & Khan, M. (2018). Role of organisational culture, leadership, and organisational citizenship behaviour on knowledge management. *International Journal of Knowledge Management Studies*, 9(2), 129-143.
- McGrath, C., Palmgren, P. J., & Liljedahl, M. (2019). Twelve tips for conducting qualitative research interviews. *Medical teacher*, 41(9), 1002-1006.
- McGuinness, S., Pouliakas, K., & Redmond, P. (2021). Skills-displacing technological change and its impact on jobs: challenging technological alarmism?. *Economics of Innovation and New Technology*, 1-23.

- Mitra, A., Gaur, S. S., & Giacosa, E. (2019). Combining organizational change management and organizational ambidexterity using data transformation. *Management decision*.
- Moradi, M., Moradi, M., Bayat, F., & Toosi, A. N. (2019). Collective hybrid intelligence: towards a conceptual framework. *International Journal of Crowd Science*.
- Morgan, B. J. (2018). *Analysis of quantal response data*. Chapman and Hall/CRC.
- Nadkarni, S., & Chen, J. (2014). Bridging yesterday, today, and tomorrow: CEO temporal focus, environmental dynamism, and rate of new product introduction. *Academy of Management Journal*, 57(6), 1810-1833.
- Newell, A. (1994). *Unified theories of cognition*. Harvard University Press.
- Ng, A. (2016). What artificial intelligence can and can't do right now. *Harvard Business Review*, 9(11).
- Odoom, R., & Mensah, P. (2018). Brand orientation and brand performance in SMEs: The moderating effects of social media and innovation capabilities. *Management Research Review*.
- Onwuegbuzie, A. J., & Collins, K. M. (2007). A typology of mixed methods sampling designs in social science research. *Qualitative Report*, 12(2), 281-316.
- Ostheimer, J., Chowdhury, S., & Iqbal, S. (2021). An alliance of humans and machines for machine learning: Hybrid intelligent systems and their design principles. *Technology in Society*, 66, 101647..
- Oztemel, E., & Gursev, S. (2020). Literature review of Industry 4.0 and related technologies. *Journal of Intelligent Manufacturing*, 31(1), 127-182.
- Palladan, A. A., Abdul Kadir, K., & Yen, W. C. (2016). Effects of strategic leadership, organizational innovativeness and information technology capability on effective strategy implementation. *International Journal of Organizational & Business Excellence*, 1(2), 1-18.

- Pappas, I. O., Mikalef, P., Giannakos, M. N., Krogstie, J., & Lekakos, G. (2018). Big data and business analytics ecosystems: paving the way towards digital transformation and sustainable societies. *Information Systems and e-Business Management*, 16(3), 479-491.
- Pillai, R., Yadav, S., Sivathanu, B., Kaushik, N., & Goel, P. (2021). Use of 4.0 (I4. 0) technology in HRM: a pathway toward SHRM 4.0 and HR performance. *Foresight*.
- Ponterotto, J. G. (2006). Brief note on the origins, evolution, and meaning of the qualitative research concept thick description. *The qualitative report*, 11(3), 538-549.
- Quinlan, C., Babin, B., Carr, J., Griffin, M., & Zikmund, W. (2018). Business Research Methods (Second Edi). *Cengage Learning EMEA*.
- Raisch, S., & Krakowski, S. (2021). Artificial intelligence and management: The automation–augmentation paradox. *Academy of Management Review*, 46(1), 192-210.
- Ramrathan, D., & Sibanda, M. (2017). The impact of information technology advancement on intuition in organisations: A phenomenological approach. *The Journal of Developing Areas*, 51(1), 207-221.
- Rosenbaum, D., More, E., & Steane, P. (2018). Planned organisational change management: Forward to the past? An exploratory literature review. *Journal of Organizational Change Management*.
- Romero, D., Bernus, P., Noran, O., Stahre, J., & Fast-Berglund, Å. (2016). The operator 4.0: Human cyber-physical systems & adaptive automation towards human-automation symbiosis work systems. In *IFIP international conference on advances in production management systems* (pp. 677-686). Springer, Cham.
- Samimi, M., Cortes, A. F., Anderson, M. H., & Herrmann, P. (2020). What is strategic leadership? Developing a framework for future research. *The Leadership Quarterly*, 101353.
- Sanders, A., K Subramanian, K. R., Redlich, T., & Wulfsberg, J. P. (2017, September). Industry 4.0 and lean management–synergy or contradiction?. In *IFIP international*

- conference on advances in production management systems* (pp. 341-349). Springer, Cham.
- Saunders, M., & Lewis, P. (2017). *Doing research in business and management*. Pearson.
- Saviano, M., Caputo, F., Mueller, J., & Belyaeva, Z. (2018). Competing through consonance: a stakeholder engagement view of corporate relational environment: Array. *Sinergie italian journal of management*, 36(Jan-Apr).
- Scuotto, V., Santoro, G., Bresciani, S., & Del Giudice, M. (2017). Shifting intra-and inter-organizational innovation processes towards digital business: an empirical analysis of SMEs. *Creativity and Innovation Management*, 26(3), 247-255.
- Schoemaker, P. J., Heaton, S., & Teece, D. (2018). Innovation, dynamic capabilities, and leadership. *California management review*, 61(1), 15-42.
- Schumpeter, J. A. (1939). A theoretical, historical and statistical analysis of the Capitalist process. *Business cycles*.
- Sebastian, I. M., Ross, J. W., Beath, C., Mocker, M., Moloney, K. G., & Fonstad, N. O. (2020). How big old companies navigate digital transformation. In *Strategic information management* (pp. 133-150). Routledge.
- Seeber, I., Bittner, E., Briggs, R. O., De Vreede, T., De Vreede, G. J., Elkins, A., ... & Söllner, M. (2020). Machines as teammates: A research agenda on AI in team collaboration. *Information & management*, 57(2), 103174.
- Singh, A., & Hess, T. (2020). How chief digital officers promote the digital transformation of their companies. In *Strategic Information Management* (pp. 202-220). Routledge.
- Sim, E. W., Griffin, A., Price, R. L., & Vojak, B. A. (2007). Exploring differences between inventors, champions, implementers and innovators in creating and developing new products in large, mature firms. *Creativity and Innovation Management*, 16(4), 422-436.
- Sivathanu, B., & Pillai, R. (2018). Smart HR 4.0—how industry 4.0 is disrupting HR. *Human Resource Management International Digest*.

- Sjödin, D., Parida, V., Palmié, M., & Wincent, J. (2021). How AI capabilities enable business model innovation: Scaling AI through co-evolutionary processes and feedback loops. *Journal of Business Research*, 134, 574-587.
- Someh, I., Davern, M., Breidbach, C. F., & Shanks, G. (2019). Ethical issues in big data analytics: A stakeholder perspective. *Communications of the Association for Information Systems*, 44(1), 34.
- Sonya, M., & Naik, S. (2020). Critical factors for the successful implementation of Industry 4.0: a review and future research direction. *Production Planning & Control*, 31(10), 799-815. <https://doi.org/10.1080/09537287.2019.1691278>
- Sousa, M. J., & Rocha, A. (2019). Skills for disruptive digital business. *Journal of Business Research*, 94, 257-263.
- Sternberg, R. J. (1986). *Critical Thinking: Its Nature, Measurement, and Improvement*.
- Surbakti, F. P. S., Wang, W., Indulska, M., & Sadiq, S. (2020). Factors influencing effective use of big data: A research framework. *Information & Management*, 57(1), 103146.
- Szalavetz, A. (2019). Industry 4.0 and capability development in manufacturing subsidiaries. *Technological Forecasting and Social Change*, 145, 384-395.
- Tabesh, P., Vera, D., & Keller, R. T. (2019). Unabsorbed slack resource deployment and exploratory and exploitative innovation: How much does CEO expertise matter?. *Journal of Business Research*, 94, 65-80.
- Tambe, P., Cappelli, P., & Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward. *California Management Review*, 61(4), 15-42.
- Tarafdar, M., Beath, C. M., & Ross, J. W. (2019). Using AI to enhance business operations. *MIT Sloan Management Review*, 60(4), 37-44.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long range planning*, 51(1), 40-49.

- Tian, M., Deng, P., Zhang, Y., & Salmador, M. P. (2018). How does culture influence innovation? A systematic literature review. *Management Decision*.
- Tortorella, G. L., & Fettermann, D. (2018). Implementation of Industry 4.0 and lean production in Brazilian manufacturing companies. *International Journal of Production Research*, 56(8), 2975-2987.
- Turing, A. M. (1950). Mind. *Mind*, 59(236), 433-460.
- Troisi, O., Grimaldi, M., Loia, F., & Maione, G. (2018). Big data and sentiment analysis to highlight decision behaviours: A case study for student population. *Behaviour & Information Technology*, 37(10-11), 1111-1128.
- Troisi, O., Maione, G., Grimaldi, M., & Loia, F. (2020). Growth hacking: Insights on data-driven decision-making from three firms. *Industrial Marketing Management*, 90, 538-557.
- Upchurch, M. (2018). Robots and AI at work: the prospects for singularity. *New Technology, Work and Employment*, 33(3), 205-218.
- Uygun, Y. (2021). The Fourth Industrial Revolution-Industry 4.0. Available at SSRN 3909340.
- Van der Aalst, W. M., Bichler, M., & Heinzl, A. (2018). Robotic process automation. *Business & information systems engineering*, 60(4), 269-272.
- van Hoek, R., Gibson, B., & Johnson, M. (2020). Talent management for a post-COVID-19 supply chain—The critical role for managers. *Journal of Business Logistics*.
- Van Rijmenam, M., Erekhinskaya, T., Schweitzer, J., & Williams, M. A. (2019). Avoid being the Turkey: How big data analytics changes the game of strategy in times of ambiguity and uncertainty. *Long Range Planning*, 52(5), 101841.
- Vanhaverbeke, W., & Cloudt, M. (2014). Theories of the firm and open innovation. *New frontiers in open innovation*, 256.
- Vera, D., Bonardi, J. P., Hitt, M. A., & Withers, M. C. (2022). Extending the boundaries of strategic leadership research. *The Leadership Quarterly*, 101617.

- Vogt, W. P., & Johnson, R. B. (2015). *The SAGE dictionary of statistics & methodology: A nontechnical guide for the social sciences*. Sage publications.
- Von Krogh, G. (2018). Artificial intelligence in organisations: New opportunities for phenomenon-based theorizing. *Academy of Management Discoveries*.
- Wamba, S. F. (2017). Big data analytics and business process innovation. *Business Process Management Journal*.
- Wang, S., Liu, Y., & Shalley, C. E. (2018). Idiosyncratic deals and employee creativity: The mediating role of creative self-efficacy. *Human Resource Management, 57*(6), 1443-1453.
- Waterman Jr, R. H., Peters, T. J., & Phillips, J. R. (1980). Structure is not organization. *Business horizons, 23*(3), 14-26.
- WEF. (2020). The future of jobs report 2020. Geneva, Switzerland: World Economic Forum.
- Weill, P., & Woerner, S. L. (2018). Is your company ready for a digital future?. *MIT Sloan Management Review, 59*(2), 21-25.
- Wilson, H. J., & Daugherty, P. R. (2018). Collaborative intelligence: Humans and AI are joining forces. *Harvard Business Review, 96*(4), 114-123.
- Yablonsky, S. (2019). Multidimensional data-driven artificial intelligence innovation. *Technology innovation management review, 9*(12), 16-28.
- Yarbrough, L., Morgan, N. A., & Vorhies, D. W. (2011). The impact of product market strategy-organizational culture fit on business performance. *Journal of the academy of marketing science, 39*(4), 555-573.
- Zaitsava, M., Marku, E., & Di Guardo, M. C. (2022). Is data-driven decision-making driven only by data? When cognition meets data. *European Management Journal*.

APPENDIX A – INTERVIEW GUIDE

Expected Duration: 60 minutes

Title: Adopting collective hybrid intelligence principles to enhance corporate innovation and process efficiencies.

8.1 EXPLANATION OF THE RESEARCH

The primary objective of the research is to discover the factors of collective hybrid intelligence (CHI) that could enhance corporate innovation and the efficiencies of processes. The term collective hybrid intelligence refers to the symbiosis between human intelligence and artificial intelligence, augmenting their strengths to increase the efficiency of job execution. It is constructed on the idea that humans and computers have complementary capabilities and strengths that can supplement each other and improve their combined abilities and efficiencies (Dellermann, Ebel, Söllner & Leimeister, 2019). The research will focus in particular on examining the “hard” and “soft” factors of Mckinsey’s 7S model. The “hard” factors, which includes strategy, structure and systems, are tangible and can be directly influenced by management, whereas the “soft” factors, which includes skills, style, staff and shared values are less tangible and influenced by the organisational culture.

In order to gain a deeper understanding of the problem, the following research question is proposed:

What are the key factors in the adoption of CHI principles that could enhance corporate innovation and process efficiencies upon adoption?

The aim of the research is to gain insights into the following:

1. What are the key soft and hard factors when adopting CHI principles that that could enhance corporate innovation?
2. What are the key soft and hard factors when adopting CHI principles that that could enhance process efficiencies?

By gaining a deeper understanding in the areas expressed above, the research aims to build on the existing literature through the analysis of the feedback received from participants. The research intends to identify the impact of each of the factors related to CHI on corporate innovation and process efficiencies.

Before starting with the interview questions, the interviewer should ensure that the interviewee understands the subject and if additional clarity is required on the topic or any sections of the topic.

8.2 INTERVIEW QUESTIONS

Q1 – What industry do you currently work in?

Q2 – How many years work experience do you have?

Q3 – How long have you been in your current role?

Q4 – How many people work in your organization?

Q5 – What are the key “soft” factors when adopting collective hybrid intelligence principles that may enhance corporate innovation?

Q6 – What are the key “hard” factors when adopting collective hybrid intelligence principles that may enhance corporate innovation?

Q7 – What are the key “soft” factors when adopting collective hybrid intelligence principles that may enhance process efficiencies?

Q8 – What are the key “hard” factors when adopting collective hybrid intelligence principles that may enhance process efficiencies?

APPENDIX B – CONSENT FORM

INFORMED CONSENT LETTER

Title: Adopting collective hybrid intelligence principles to enhance corporate innovation and process efficiencies.

Researcher: Ernst Taljaard, MBA student at the Gordon Institute of Business Science.

I am conducting a study into the factors of adopting collective hybrid intelligence principles to enhance corporate innovation and process efficiencies.

The interview is expected to be approximately an hour long and will hopefully assist in identifying new factors, or strengthening the existing theory on the factors of adopting collective hybrid intelligence principles to enhance corporate innovation and process efficiencies. The research will focus on the soft and hard elements of the Mckinsey 7S model, which includes skills, leadership styles, organisational structure, strategy, systems, staff and shared values.

Your participation is voluntary, and you can withdraw at any time. The interview will be audio recorded, however you may choose not to be recorded. All information will be kept confidential and will only be reported on in aggregation with that of other respondents .

Should you have any concerns, you may contact myself or my supervisor.

Researcher: Ernst Taljaard

Research Supervisor: Dr Jefferson Yu-Jen Chen

Email: 21828416@mygibs.co.za

Email: chenj@gibs.co.za

Phone: +27 83 605 8270

Phone: +27 72 222 7119

Signature of participant: _____ Date: _____

Signature of researcher: _____ Date: _____

APPENDIX C – ETHICAL CLEARANCE

**Gordon Institute
of Business Science**
University of Pretoria

**Ethical Clearance
Approved**

Dear Ernst Taljaard,

Please be advised that your application for Ethical Clearance has been approved.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

[Ethical Clearance Form](#)

Kind Regards

This email has been sent from an unmonitored email account. If you have any comments or concerns, please contact the GIBS Research Admin team.

APENDIX D - ATLAS TI CODEGROUPS

11.1 RESEARCH QUESTION 1

Staff Training

Staff Skills

Staff Analytical Skills

Staff

Style Leadership

Style Leadership Traits

Innovative Culture

Innovative Culture

Technologies

Technological displacement

Change Management

Importance of Data

Data Analysis

Decision Engines

11.2 RESEARCH QUESTION 2

Staff Citizen Developers

Staff Training

Style Leadership

Style Leadership Traits

Collective Creativity

Training Culture

Innovative Platforms

Shared Values

Technologies

Technology as an enabler

Technological displacement

Change Management

Importance of Data

Data Analysis

Decision Engines