



Development of an integrated continuous improvement and innovation thinking model for a South African Bank

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Supervisor: Prof R Coetzee

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“Commit yourself to lifelong learning. The most valuable asset you’ll ever have is your mind and what you put into it.”

Brian Tracy

DECLARATION

I, Yolandie Richards, with South African ID Number 7902240031088, hereby declare that the work contained in this document is my own autonomous work. All experiments carried out were for this study and have not been published in whole or in part in pursuit of any other academic qualification or publication.

PREFACE

This thesis has been compiled and is presented in accordance with the General Academic Rules of the North-West University (approved by Council on 13 March 2024). In accordance with Rule 5.12.2, where a research product is submitted in the form of research articles, the thesis must be presented as an integrated and coherent unit, supplemented with a problem statement, introduction, and synoptic conclusion, together with reference to the submission guidelines of the relevant scholarly journal(s).

Where a co-authored article forms part of the research product, the involvement of the co-author must be acknowledged, and a statement of permission for inclusion must be provided. This acknowledgment and permission are therefore included at the end of this preface, as required by Rule 5.12.2.

STRUCTURE OF THIS REPORT

The research followed a Design Science Research (DSR) process and was executed in four distinct phases, each contributing to the iterative development and validation (evaluation) of the integrated model. This report is structured into 12 chapters, organised into Sections, covering the four phases of the research process.

Section A: Contextualisation.

The first section of this report comprises Chapters 1-3, which provide an overview of the research problem, the existing literature, and the research design employed in this study.

Section B: Empirical Research

Section B consists of Chapters 4-7 and reports on the empirical research conducted in Phases 1 to 3 of the research process. This includes the root cause analysis, the Delphi technique and the development of the conceptual model.

Section C: Verification and Validation (Evaluation)

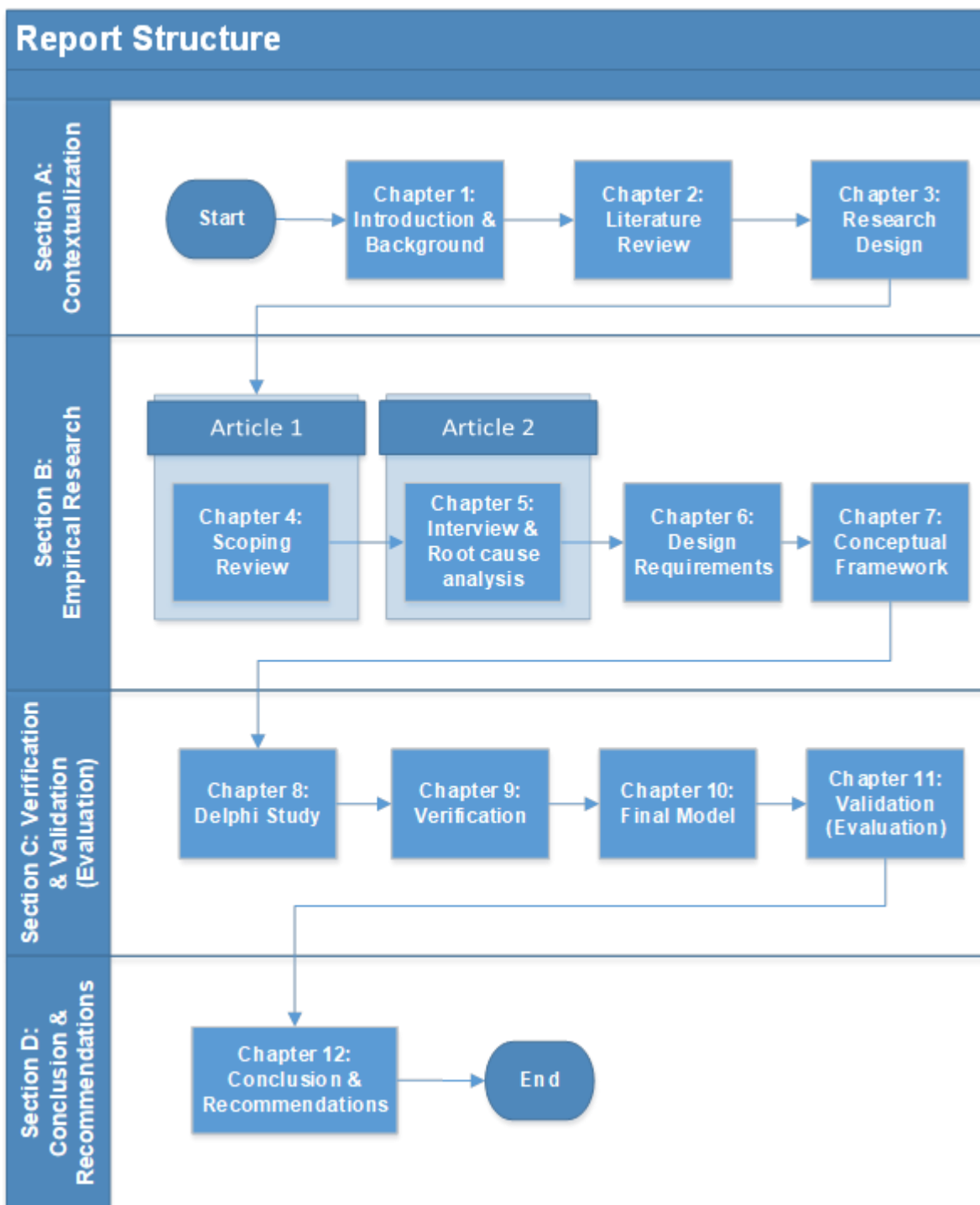
Chapters 8-11 describe the processes used to verify adherence to the model's design requirements and to validate (Evaluate) the research process, outcomes, and the solution to the problem. This is a qualitative study. It is important to note that validation and evaluation are used interchangeably in this thesis to align with the principles of trustworthiness in qualitative research.

When this study refers to evaluation, it relates to the validation of the research process (Tracy, 2023).

Section D: Conclusion and Recommendations

Chapter 12 presents conclusions and recommendations for future research.

Refer to Preface 1-1 for the Report Structure.



Preface 1-1: Report Structure

CO-AUTHOR STATEMENT

I, Rojanette Coetzee, hereby confirm that the articles entitled

Integrating Continuous Improvement and Innovation Thinking: A Scoping Review

Integrating Continuous Improvement and Innovation Thinking in the Banking Sector: A Case Study from South Africa,

authored by Yolandie Richards and me, may be included as part of this thesis submitted to the North-West University.

I further confirm that the doctoral candidate was the lead contributor responsible for the conceptualisation, research execution, data analysis, and manuscript development.

Sincerely,

Prof Rojanette Coetzee

ACKNOWLEDGEMENTS

I want to thank the following people, who each played a vital role during my research:

Prof Rojanette Coetzee, my supervisor, repeatedly reminded me to try again. Thank you for your patience, your knowledge sharing and all the laughs in between.

Dr Sandra Steyn, my mentor, who never got tired of my endless questions and stood by my side until the completion of my research. Thank you for reminding me of the constant progress and for teaching me that it is made in small steps until we reach our final destination.

To all the **Participants**, thank you for your time and valuable input in building this new integrated model.

My parents, **Louis and Annelie Steyn**, who never stopped believing in me, even when I struggled to believe in myself. Who taught me that we work first, then play? From an early age, they created opportunities for me and were always there to support and encourage me, no matter which path I chose. They showed me the value of education and continuous personal growth. My parents taught me not to fear failure, to have the mindset that failure is not a permanent state but rather an opportunity to learn from it and try again with the lessons learned. I will forever be grateful to my parents for their role. I could not have done this without my parents. Thank you, Mom and Dad.

My children, **Kobus and Annelie Richards**, who understood and never questioned my closed door, meaning “I am busy now”. Thank you both for filling in for me when I needed you to.

ABSTRACT

Companies cannot succeed without actively focusing on both Continuous Improvement and Innovation Thinking simultaneously. Often, organisations apply these methodologies in isolation or use only one. In South Africa's banking industry, a clear gap has been identified in the lack of integrated implementation of Continuous Improvement and Innovation Thinking. This research aimed to explore how these two concepts could be integrated into an improvement strategy specifically for the South African banking sector.

The research involved reviewing the latest literature on Continuous Improvement and Innovation Thinking methodologies used across various countries and industries. It also sought to determine the root causes for the failure to utilise and combine both methods through a qualitative study. Additionally, the study aimed to identify the elements necessary for a theoretical framework integrating Continuous Improvement and Innovation Thinking. This was done through interviews with banking practitioners specialising in both of these areas.

The ultimate goal was to develop a verified and validated (evaluated) artefact that integrates Continuous Improvement and Innovation Thinking for the banking sector in South Africa. This artefact was informed by both literature and interview findings, highlighting identified challenges and proposing solutions. The resulting integrated model incorporates different phases tailored to the organisation's maturity level, acknowledging that various areas may have distinct levels of maturity in Continuous Improvement and innovation.

The new model includes various Continuous Improvement and Innovation methodologies along with their respective steps. It also specifies different roles for participants in each phase, depending on the organisation's maturity level.

This study offers an integrated solution to issues that were previously addressed separately. The new integrated model will help companies drive Continuous Improvement and innovation in a coordinated way, which is essential for maintaining market competitiveness.

Key terms: Continuous Improvement, Innovations, Lean, Six Sigma, Design thinking, ARIZ/TRIZ, South African Bank.

OPSOMMING

Maatskappye kan nie volhoubare sukses behaal sonder 'n doelgerigte fokus op beide Voortdurende Verbetering en innovasiedenke nie. Tog word hierdie benaderings dikwels apart toegepas, of organisasies maak slegs van een gebruik. In die Suid-Afrikaanse banksektor is daar 'n duidelike gaping geïdentifiseer: die gebrek aan 'n geïntegreerde implementering van Voortdurende Verbetering en innovasiedenke. Hierdie studie het ten doel gehad om te ondersoek hoe hierdie twee benaderings in 'n geïntegreerde verbeteringsstrategie vir die Suid-Afrikaanse bankbedryf saamgevoeg kan word.

Die navorsing het bestaan uit 'n omvattende literatuuroorsig van die mees onlangse metodologieë vir Voortdurende Verbetering en innovasiedenke, soos toegepas in verskeie lande en sektore. Die studie het ook gepoog om die onderliggende oorsake vir organisasies se versuim om hierdie twee benaderings te benut en te integreer, deur middel van 'n kwalitatiewe navorsingsontwerp, te identifiseer. Verder is gepoog om die sleutelelemente te bepaal wat nodig is vir die ontwikkeling van 'n teoretiese raamwerk wat Voortdurende Verbetering en innovasiedenke in 'n samehangende model kombineer. Hierdie insigte is verkry deur onderhoude met bankpraktisyne wat in hierdie veld spesialiseer.

Die uiteindelige doel was om 'n geverifieerde en gevalideerde model te ontwikkel wat Voortdurende Verbetering en innovasiedenke vir die banksektor integreer. Hierdie model is gebaseer op sowel die literatuurbevindinge as die empiriese data van die onderhoude en gee uitdrukking aan geïdentifiseerde uitdagings en voorgestelde oplossings. Die gevolglike geïntegreerde model bestaan uit verskillende fases wat aangepas is by die organisasie se volwassenheidsvlak, met die erkenning dat afsonderlike areas binne 'n organisasie verskillende vlakke van volwassenheid ten opsigte van Voortdurende Verbetering en innovasie mag hê.

Die model sluit verskeie metodologieë vir Voortdurende Verbetering en innovasie in, elk met hul spesifieke stappe. Daarbenewens spesifiseer dit die rolspelers wat by elke fase betrokke is, afhangend van die organisasie se ontwikkelingsvlak. Hierdie studie bied 'n geïntegreerde oplossing vir uitdagings wat voorheen afsonderlik hanteer is. Die nuwe model sal maatskappye in staat stel om Voortdurende Verbetering en innovasie op 'n gekoördineerde en strategiese wyse aan te dryf — 'n kritiese vereiste vir die handhawing van mededingendheid in die mark.

Sleuteltermes: Voortdurende Verbetering, Innovasies, Lean; Six Sigma, Ontwerpsdenke, ARIZ/TRIZ, Suid-Afrikaanse Bank.

LIST OF ABBREVIATIONS

ARIZ	Algorithm for Inventive Problem Solving
BOK	Body of Knowledge
CI	Continuous Improvement
CII	Continuous Improvement & Innovations
CII Integration Model	Continuous Improvement & Innovations Integration Model
COQ	Cost to Quality
CR	Contextual Requirement
CTQ	Critical to Quality
CX	Customer Experience
DCT	Dynamic Capabilities Theory
DMAIC	Define, Measure, Analyse, Improve, and Control
DOE	Design of Experiments
DSR	Design Science Research
FMEA	Failure Mode and Effect Analysis
FR	Functional Requirement
H1	Horizon 1
H2	Horizon 2
H3	Horizon 3
NDA	Non-disclosure agreement
NWU	North-West University
PDCA	Plan, Do, Check & Act
PDSA	Plan, Do, Study & Act
PR	Process Requirement
RCQA	Relative Competitive Quality Advantage

RBV	Resource-Based View
RPT	Relative Proximity Theory
RR	Role Requirement
SIPOC	Supplier, Input, Process, Output and Customer
SPC	Statistical Process Control
SR	System Requirement
TPM	Total Productive Management
TQM	Total Quality Management
TRIZ	Theory of Inventive Problem Solving
USA	United States of America
VOC	Voice of Customer

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CHAPTER 1 INTRODUCTION AND BACKGROUND

1.1 Chapter Orientation

The research report is broken down into 12 chapters and four (4) sections. Chapter 1 serves as the primary orientation for this research, situating the study within the competitive and volatile environment of the South African banking sector. This chapter serves as the foundational building block of the thesis by contextualising the research problem and establishing the study's strategic rationale. It identifies a critical knowledge gap: the lack of methodologically sound frameworks that integrate Continuous Improvement (CI) and Innovation Thinking within service industries (Richards & Coetzee, 2026a). By defining the research aims and formulating the primary research questions, Chapter 1 provides an essential foundation for the theoretical framework explored in Chapter 2 and the qualitative research design outlined in Chapter 3. Additionally, it introduces a structured four-phase Design Science Research (DSR) process, ensuring that the lineage of the final CII Integration Model is both traceable and methodologically sound.

Figure 1-1 indicates the position of the current chapter within the bigger report structure.

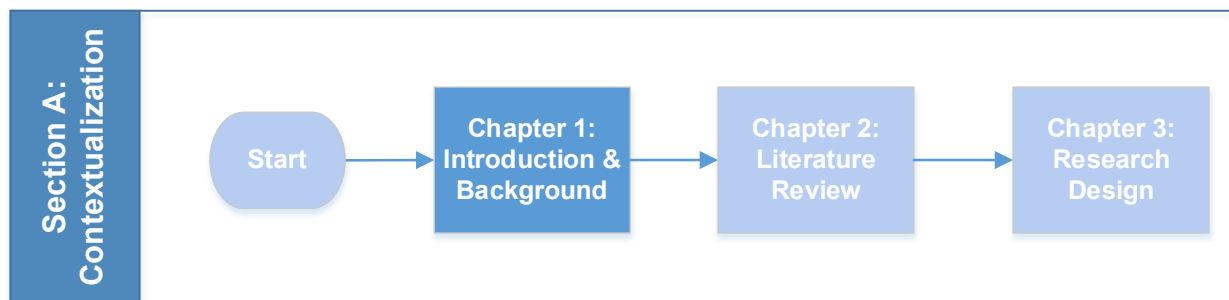


Figure 1-1: Report Structure: Introduction and Background

To survive and thrive in today's global economy, companies must continuously strive to improve their competitiveness (Teece, 2025; Teece et al., 1997). Yasar (2019) noted that companies cannot be successful if they do not actively focus on applying both Continuous Improvement and Innovation Thinking.

Lizarelli (2023) further indicated that Continuous Improvement (hereafter CI) thinking is a key capability associated with incremental process improvement and problem-solving, implemented through programs such as Lean, Six Sigma, and Lean Six Sigma. Lizarelli (2023) described lean as focusing on process improvement through waste elimination, while Six Sigma focuses on reducing process variability and achieving statistical process control. Abdallah (2019) noted that Lean, part of the CI methodology, enables organisations to promote an innovation culture. CI could therefore be seen as an innovation strategy for improving organisations (Otieno, 2016).

To this end, Tohidi & Jabbari (2012) and Otieno (2016) referred to Innovation Thinking as a way to introduce new services or products, or to implement radical changes within the company. The main goal is to find new or disruptive ways to enter the current market. Additionally, Yasar (2019) emphasised the importance of combining both methodologies to achieve sustainable performance and highlighted the detrimental effects of failing to implement them simultaneously. Therefore, companies cannot achieve financial success solely by concentrating on innovation. Focusing solely on Continuous Improvement can lead to financial weakness by neglecting the need for radical innovation to remain competitive (Yasar, 2019).

1.2 Integrating CI and Innovation Thinking

To thrive in today's volatile global economy, organisations must move beyond static practices and actively concentrate on improving their competitiveness (Teece, 2025; Teece et al., 1997). Achieving a sustainable competitive advantage in the highly information-intensive South African banking sector requires integrating CI and innovative behaviours at every stage of the organisation's activities (Porter, 1985). While organisations often apply these methodologies in isolation, their simultaneous application is essential for financial success and ensuring the organisation remains future-ready (Yasar et al., 2019). To facilitate this integration, it is essential to establish clear definitions for the core constructs that drive organisational growth.

CI is generally understood as a planned, organised, and systematic process of ongoing, staggered change aimed at improving company performance (Boer & Gertsen, 2003). It is a process-focused strategy intended to decrease inefficiencies, eliminate waste, and optimise current business performance (Anand & Kodali, 2010). Therefore, in this study, CI represents the development of established capabilities and routines to ensure operational effectiveness (Boer & Gertsen, 2003).

In contrast, Innovation Thinking refers to the cognitive ability to generate original ideas and solutions that depart from traditional patterns (Dieffenbacher et al., 2024). It acts as a catalyst for change, allowing individuals to challenge the status quo and envision novel procedures or disruptive solutions (March, 1991). Unlike the often-reactive nature of CI, Innovation Thinking is exploratory and focuses on novel possibilities to meet future needs (March, 1991). This mindset is characterised by creative problem-solving and a balanced interplay between analytical and intuitive thinking (Martin, 2010).

To ensure these creative ideas are successfully realised as tangible value, organisations utilise Innovation Management. This is a formal discipline that combines the freedom and creativity of idea generation with the rigour required to manage risks, investments, and project implementation (Rezak et al., 2023). According to ISO 56002:2019, an innovation management system is a set

of interrelated elements and activities, including leadership, culture, and resources, that enable an organisation to transform creative insights into realised value (ISO, 2019). Implementing such a standard helps businesses adapt to volatility and enhance consumer satisfaction (Rezak et al., 2023).

This current study focuses on process innovation and its integration with CI methodologies. While innovation can be categorised into product and process domains, process innovation assesses an organisation's ability to identify and implement improvements within its internal processes (Lizarelli et al., 2023). CI is fundamentally aligned with process innovation because it focuses on the incremental optimisation of existing mechanisms rather than the development of entirely new product lines (Boer & Gertsen, 2003).

The importance of this dual focus is illustrated through the three-horizon methodology (Penker et al., 2018). This has been illustrated through his three-horizon methodology (H1, H2, and H3). Penker et al. (2018) described the first horizon (H1) as the smaller, incremental form of Innovation Thinking that builds on existing business models. Thus, the typical CI improvements. The second horizon (H2) involves more creative improvements and the expansion of new businesses. Breakthrough projects characterise the third horizon (H3). The second and third horizons are more innovative solutions.

However, Penker et al (2018) explained that the biggest failure is that companies are stuck in the CI space (H1) and do not focus enough on the Innovative projects space (H2 and H3). Notably, there is less focus on radical innovation because it is perceived as riskier and does not yield rapid, substantial profits in the short term; only a tiny percentage of these innovative ideas succeed. Therefore, companies tend to focus more on continuous improvement, typically incremental Innovation Thinking, as it is easier and quicker to realise the benefits. By narrowing the scope to the integration of CI and process-centric Innovation Thinking, this study seeks to foster contextual ambidexterity (Chapter 2; Tushman & O'Reilly, 1996). This study further utilises Porter's (1985) Value Chain as a diagnostic framework to pinpoint process gaps and define where CI and Innovation Thinking must be orchestrated to maintain market position.

1.3 CI and Innovation Thinking in the Banking Industry

The history of banking in South Africa began with the Lombard Bank, established in 1793, followed by the country's first private institution, the Cape of Good Hope Bank, in 1837 (Evolution and Digital Transformation of South African Banking, 2026).

Entry into this highly concentrated market is hindered by significant barriers, including massive sunk costs for IT systems and branch networks, stringent regulatory capital

requirements, and the "stickiness" of customers who find switching providers cumbersome (Makhaya & Nhundu, 2016). Capitec Bank disrupted this landscape after registering in 2001 during a "small banks crisis", successfully targeting the unbanked and underserved through a "single status" culture and simplified, low-cost products (Makhaya & Nhundu, 2016).

The recent era is defined by a digital revolution, with the rise of Discovery Bank (2018) and TymeBank (2019), the latter becoming South Africa's first fintech bank, with a \$1.5 billion valuation by the end of 2024 (Mncanca, 2025). Traditional institutions have responded by becoming "digitised incumbents," closing physical branches and migrating millions of customers to AI-driven mobile applications (Berrington, 2025; Mothibi & Rahulani, 2021).

South African banks are globally recognised leaders in digital innovation, currently ranking second in the world on the Oliver Wyman Digital Banking Index, surpassed only by Singapore (Romagny, 2024). This positioning places the South African banking sector ahead of major developed economies, including the United Kingdom, Spain, and Germany (Romagny, 2024).

Most recently, legacy insurers such as Old Mutual have officially entered the sector, investing billions to launch licensed banking services and intensify competition for transactional and savings accounts (Mncanca, 2025).

How South African banks compete internationally in terms of innovation is categorised into four pillars: (a) Global benchmarks and performance, (b) strategic design and CI, (c) advanced technology and AI adoption and (d) fintech ecosystems and resilience. The first pillar, global benchmarks and performance, includes end-to-end digital sales as South Africa sets the global benchmark for purchasing banking products seamlessly through mobile apps or online, achieving the highest score among 11 index countries (Romagny, 2024). Between 2020 and 2024, all major local banks improved their digital maturity and services, driven by enhancements to customer support channels and payment options (Romagny, 2024). It is also evident in Operational Efficiency, as local disruptors such as Capitec have achieved cost-to-income ratios considered very low by international standards (Makhaya & Nhundu, 2016).

The second pillar includes strategic design and CI. South African banks compete through distinct digital transformation strategies and a focus on CI, a strategic approach for developing a sustainable culture of quality, productivity, and innovation (Wang et al., 2012). Also, through Customer Engagement vs Digitised Solutions. South African banks leverage Lean Six Sigma (LSS) as a methodology to support CI and build these dynamic optimisation systems (Wang et al., 2012). The third pillar includes advanced technology and AI adoption. By 2026, the South African sector is expected to move from isolated AI experiments to the large-scale deployment of "agentic AI", autonomous systems capable of making decisions and executing tasks with minimal

human intervention (Moyo, 2026). Capitec recently launched Capitec Pulse, an agentic solution that analyses a client's activity in real-time during an inbound call to resolve issues in seconds rather than days (Moyo, 2026). Major banks are applying AI tools across their African operations for customer engagement analytics and automated software engineering (Moyo, 2026).

The fourth pillar includes fintech ecosystems and resilience. Unlike markets such as Kenya, where mobile money "leapfrogged" traditional systems, South Africa's fintech revolution is firmly rooted in its traditional banks (Mondato, 2023). South African fintech's have experienced fewer layoffs than their international counterparts during global downturns, demonstrating fiscal resilience. (Mondato, 2023). This is attributed to a unique culture where many startups are self-funded and built from the ground up, rather than relying on volatile global funding rounds (Mondato, 2023).

South African banks are currently under-indexed internationally in robo-advisory and "platform" capabilities that integrate non-banking services (Romagny, 2024). The lag in robo-advisory is often a deliberate strategic choice to prioritise human advisory roles and relationships (Romagny, 2024). While South Africa has a high account ownership rate (85% in 2021), it suffers from a "post box" phenomenon (Mondato, 2023). Many users withdraw their entire wages as cash immediately upon receipt, indicating a gap in digital literacy compared to other high-ranking digital banking nations (Mondato, 2023). The South African regulator is frequently compared to those in the UK and Australia for its proactive approach (Mondato, 2023). However, some stakeholders argue that this more scrutinising environment can sometimes constrain grassroots innovation compared to more open international markets (Mondato, 2023).

CI, as a focused incremental Innovation Thinking strategy, can significantly improve the efficiency and productivity of banks (Otieno, 2016). A cursory review of the literature indicated limited research on integrating CI and Innovation Thinking. The majority of research has focused on how banks can implement various CI tools (see, for example, Ahinful et al., 2024; Muriithi, 2014; Posada et al., 2022). Further, Yasar, Sezen, and Karakadilar (2019) investigated the relationship between CI, Innovation, and financial performance and found a significant relationship between CI and Innovation. This relationship has a mediating effect on organisations' economic performance. Additionally, Jantz (2016) reiterated the need to integrate CI and innovative thinking in the banking industry. Despite the call to integrate CI and Innovation Thinking in the banking industry, few scholars have reported on this integration.

1.4 Defining the knowledge gap

As part of the current research study, the author conducted a Scoping Review to confirm and define the knowledge gap. The research article is in Chapter 4.

Findings from the study (Richards and Coetzee, 2026a; Chapter 4) indicated that previous research is very specific about the Continuous Improvement methodology and the steps applied, but scholars use limited methodologies and rarely identify the specific tools they apply. The scoping review further identified a need for more research on integrating CI and Innovation Thinking, with a particular focus on the methodological steps involved.

Additionally, this review (Richards and Coetzee, 2026a; Chapter 4) highlighted a gap in existing work: the lack of integrated implementation of Continuous Improvement and Innovation Thinking in the banking industry, specifically in South Africa. The results also showed that the research was mainly distributed in healthcare, manufacturing, and production environments. Minimal research has been conducted in the service industry, and none in the banking industry. Therefore, a need was identified for further research to integrate continuous improvement and Innovation Thinking for banking in South Africa (Richards and Coetzee, 2026a; Chapter 4).

1.5 Research Problem

The problem is that Continuous Improvement and Innovation methodologies are not well integrated within the banking industry in South Africa, leading companies to lose their competitive advantage.

1.6 Research aim

This study aimed to design an improvement strategy that integrates continuous improvement and Innovation Thinking for a case study bank in South Africa.

1.7 Research Phase description

The research problem statement, objective, questions, method, artefact, relevant chapters, and publications are presented in Table 1-1. Table 1-1 is further explained in Chapter 3.

Table 1-1: Research phases description

Research Phase	Phase 1 – Scoping Review	Phase 2 – Root-Cause Analysis Interviews	Phase 3 – Development of artefact	Phase 4 – Verification and Validation (Evaluation)
	Identify and compare CI and innovation methodologies.	Explore root cause analysis, integration challenges, and organisational context (Individual interviews)	Develop an integrated model	Verification and Validation (Evaluation) of the artefact
Problem statement	Ambiguity regarding the differences and similarities between the continuous improvement and Innovation Thinking methodology.	The reasons for not combining continuous improvement and Innovation Thinking are unknown and warrant further investigation.	Companies tend to focus more on continuous improvement than on innovation, which can lead them to lose their competitive edge. No framework was designed to help companies integrate both CI and Innovation Thinking.	The CII model has not been verified, validated, or evaluated.
Objective	To conduct a scoping review of existing literature regarding the continuous improvement and Innovation Thinking methodologies applied across countries and industries.	- To determine the root causes for not utilising and combining both continuous improvement and innovation methodologies for this specific case study. - To identify elements or necessary components for a theoretical comparative framework to integrate continuous improvement and Innovation Thinking.	To develop an artefact that integrates continuous improvement and Innovative thinking for banking in South Africa from both literature and interview findings.	- To verify the applicability of the artefact in this specific bank. - To validate (evaluate) the research process and its outcomes, confirming the study's quality, credibility, and contribution in line with qualitative trustworthiness principles.

Research Phase	Phase 1 – Scoping Review	Phase 2 – Root-Cause Analysis Interviews	Phase 3 – Development of artefact	Phase 4 – Verification and Validation (Evaluation)
Questions	• What is the country and industry distribution for continuous improvement and Innovation Thinking? • What are the methodologies used for continuous improvement and Innovation Thinking? • What are the methodology steps applied for continuous improvement and Innovation Thinking? • What is the overlap and integration between continuous improvement and Innovation Thinking?	• What are the root causes of the specific case study institution for not utilising and combining both continuous improvement and Innovation Thinking? • How do continuous improvement projects differ from innovation projects in the banking industry? • How do continuous improvement projects overlap with Innovation Thinking with innovation projects in the banking industry? • How can the continuous improvement and Innovation Thinking methodologies be integrated to develop a theoretical comparative framework for the	How can continuous improvement and innovation methodology be integrated to design a coherent artefact for the banking industry?	• Verification: Does the integrated model adhere to each of the specified design requirements? • Validation (Evaluation): Has a valid (worthy) research problem been identified? • Validation (Evaluation): Was a rigorous research design followed? • Validation (Evaluation): Does the research output address the research problem and the specific and general limitations of the study?

Research Phase	Phase 1 – Scoping Review	Phase 2 – Root-Cause Analysis Interviews	Phase 3 – Development of artefact	Phase 4 – Verification and Validation (Evaluation)
		specific case study institution?		
Method	Data gathering: A scoping review. Data analysis: Thematic comparative analysis	Data gathering: Individual interviews. Data analysis: Thematic comparative analysis	Investigated design requirements. The trustworthiness principles were applied to ensure the credibility of the findings (See trustworthiness section below).	Data gathering: Individual interviews and the Delphi technique through questionnaires Data analysis: Thematic comparative analysis
Artifact	State of the art of the literature.	Report on: Root causes for not combining Continuous improvement and innovation thinking How innovation thinking and continuous improvement could be integrated in a specific bank.	An improvement strategy that integrates continuous improvement and Innovation Thinking for a case study bank in South Africa.	A verified and validated (evaluated) model that combined continuous improvement and innovative thinking for the specific case study bank
Chapter	4	5	6,7 &10	8,9 & 11
Publication	Journal article 1: Richards, Y., Coetzee, R. 2026. "The development of an integrated continuous improvement and Innovation Thinking model for a South African Bank."	Journal article 2: Richards, Y., Coetzee, R. 2026. "Integrating Continuous Improvement and Innovation Thinking in the Banking Sector: A Case Study from South Africa."		

1.8 Research Methodology

A qualitative case study approach was selected for its capacity to explore complex, real-world phenomena in depth (Creswell & Poth, 2018; Yin, 2018). The integration of CI and Innovation Thinking is a nuanced organisational process that involves technical, cultural, and contextual dimensions. A case study enabled the researcher to explore these dimensions holistically within a bounded setting, specifically, a South African bank. This design supports the generation of rich, detailed insights from practitioners actively involved in CI and innovation initiatives. The single-case approach was appropriate due to the focus on model development and context-based understanding rather than cross-case generalisation (Creswell & Poth, 2018; Yin, 2018).

The qualitative case study design employed in this study enabled the researcher to elicit information that added to, stimulated, and elaborated on existing institutional and academic knowledge regarding the integration of CI and Innovative Thinking within the banking industry (Creswell & Poth, 2018; Yin, 2018). The single-case study was designed to capture participants' perspectives on their experiences with CI and Innovation Thinking in their work environments. A qualitative inductive approach (Creswell, 2013; Creswell & Poth, 2018) was followed to explore, describe, and explain how continuous improvement and innovation methodologies were integrated into the banking industry. A single-case study was used to investigate how continuous improvement and Innovation Thinking were integrated within a specific Bank in South Africa (Yin, 2018). Chapter 3 contains a detailed description of the approach followed.

The choice of a single exploratory case study of a South African bank is motivated by the requirement for depth and contextual understanding within a specific organisation (A South African bank). It is important to note that the bank's name is withheld in accordance with stringent national ethical guidelines.

In fields where the boundaries between a phenomenon and its context are unclear (for example in the banking industry), a single case is ideal for gaining a detailed picture of the complex factors and conditions that affect change (Hancock et al., 2021; Yin, 2018). Following the logic of Siggelkow (2007), a single case is specifically valuable when the researcher has access to a unique or previously inaccessible organisational setting, allowing them to challenge or extend existing theories from the "inside". By focusing on a single institution, this research captures the richness of contextual data needed to build a data-driven model that accounts for internal variables such as people, decisions, and organisational culture.

1.9 Conclusion

The purpose of this study was to develop an artefact that encourages the integration of continuous improvement and Innovation Thinking methodologies for banking in South Africa.

CHAPTER 2 LITERATURE REVIEW

2.1 Chapter Orientation

Following the report structure, Figure 2-1 indicates the position of the current chapter within the structure presented in the Preface.

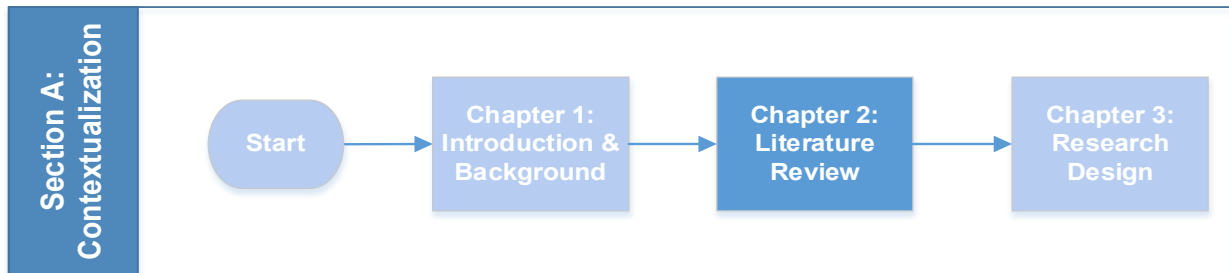


Figure 2-1: Report Structure: Literature Review

This chapter provides the theoretical scaffold for the research project by detailing the frequently used CI and Innovation Thinking methodologies. It contributes to the project in several ways:

It defines the core methodologies commonly used in the literature (e.g., Lean, Six Sigma, Design Thinking, and TRIZ) that form the model's functional base.

It establishes the technical parameters for the methodological overlap required in later design phases.

It utilises Porter's (1985) value chain logic to identify where functional quality gaps occur within a firm's linkages.

It documents existing theoretical standards, such as ISO 56002, to ensure the model's realisation of value (Rezak et al., 2023).

The insights gained in this chapter were used to develop the initial conceptual framework for integrating CI and Innovation Thinking.

Additionally, an in-depth literature review was conducted in Chapter 4 to examine the existing literature on CI and Innovation Thinking across different countries and industries. The primary focus of this review article was to identify a research gap to support the main problem identified in Chapter 1. The current chapter provides a more in-depth breakdown of the CI and Innovation Thinking methodologies. Table 2-1 below summarises the CI and Innovation Thinking literature across the different chapters.

Table 2-1: Overview of the literature available in the thesis

Chapter	Literature description
Chapter 2: Literature Review: Theoretical Theory	Literature which was not included in the Chapter 4 Scoping review: • Theoretical foundation of the study • Description of identified CI methodologies • Description of identified Innovations methodologies
Chapter 4: Scoping Review: Applied Science	A qualitative scoping review was conducted to gather information on the existing concepts and Innovation Thinking applied across different countries and industries. The following literature was included in the scoping review: • CI methodologies, tools and steps • Innovation methodologies & tools, and steps • CI and innovation methodology overlap The primary focus was to identify a gap in current research that supports the problem presented in Chapter 1.

2.2 Background

In an increasingly competitive and fast-paced business environment, organisations must constantly evolve to maintain efficiency, innovation, and sustainability, as highlighted by the Dynamic Capabilities Theory (Teece, 2025; Teece et al., 1997). Continuous improvement and innovative thinking are critical to a company's productivity and efficiency, customer and employee satisfaction, and ultimately higher profits. (Lizarelli et al., 2023). Yasar (2019) noted that companies cannot be successful or remain competitive without actively applying both Continuous Improvement and Innovation Thinking.

Continuous improvement and innovation are often viewed as separate domains. However, integrating these methodologies can significantly enhance problem-solving capabilities and long-term organisational success (Yasar, 2019).

Penker (2017) argues that one cannot be implemented without the other, and the methodologies support each other, which is needed for companies' sustainability and competitiveness. An overview of each is necessary to understand how these methodologies support one another and can be integrated within the banking industry.

2.3 Theoretical Foundation

This section establishes the theoretical foundation for integrating CI and Innovation Thinking within the South African banking sector, providing the strategic architecture required to understand how an organisation creates and sustains competitive advantage in a volatile environment. This section will address (a) Porter's Value Chain, (b) the dynamic positioning of organisations from the Resource-Based View, (c) the analytic split of capabilities and (d) organisational ambidexterity.

While this section defines the theoretical concepts and principles (the "What"), Chapter 3 provides a detailed account of how these theories were operationalised as a methodological lens (the "How"). Specifically, Chapter 3 outlines how these frameworks are applied to guide the research design, structure the thematic analysis in ATLAS.ti, and formulate the 18 design requirements for the final research artefact.

2.3.1 Competitive Advantage and the Disaggregated Value Chain

To identify and diagnose the sources of competitive advantage, this study adopts Porter's (1985) Value Chain, which provides a disaggregated view of the organisation by breaking its operations into nine discrete activity categories (Moraga-Díaz, Leiva-Araos, & García, 2023; Porter, 1985). Following this theoretical perspective, competitive advantage results from an organisation's ability to perform "value activities" either at a lower cost, in a unique way that creates superior buyer value, or at a collective cost that is less than the price buyers are willing to pay (Porter, 1985).

The Value Chain distinguishes between Primary Activities (i.e. Inbound Logistics, Operations, Outbound Logistics, Marketing and Sales, and Service) and Support Activities (i.e. Organisational Infrastructure, HR Management, Technology Development, and Procurement). Furthermore, a central tenet of the value chain is that activities are not independent but are connected through linkages. A linkage exists when the way one activity is performed affects the cost or effectiveness of another. For example, higher investment in a support activity, such as Technology Development (e.g., advanced data processing), may lower the cost of a primary activity, such as Operations (e.g., loan processing), or improve the quality of Service. Superior performance, therefore, depends on identifying and managing the linkages among these activities, in which a failure in a support activity (such as outdated IT infrastructure) directly creates a functional quality gap in primary service delivery. This Value Chain model utilises this disaggregation to pinpoint where CI should stabilise primary routines and where Innovation Thinking must reconfigure support structures to maintain global competitiveness.

In the information-intensive banking sector, competitive advantage is increasingly a game of coordination, ensuring that dispersed value activities work together as a cohesive system rather than as isolated silos. This coordination enables the bank to identify and close functional quality gaps in which a failure in a support routine directly hinders primary service delivery (Richards & Coetzee, 2026a).

As part of the Value Chain, Porter (1985) further distinguishes between activities based on their proximity to the buyer:

Downstream Activities: These are buyer-related activities (e.g., Marketing, Sales, and Service) where competitive advantage is often tied to the bank's local reputation, brand name, and service network (Ahinful et al., 2025; Porter, 1985).

Upstream and Support Activities: These include Operations and Technology Development, which are often the primary drivers of global competitive advantage because they represent the core technical and strategic "engine" of the organisation (Tilocca et al., 2023)

The configuration of the value chain is also shaped by the organisation's competitive scope, which includes the range of customer segments served (segment scope), the industries in which the organisation competes (industry scope), the activities performed in-house versus by suppliers (vertical scope), and the regions in which it operates (geographic scope) (Porter, 1985). By analysing these dimensions, the bank can determine the most effective boundaries for its activities, ensuring that it "senses" external threats and "seizes" new business models through the strategic reconfiguration of its value chain. By applying the creative catalysts of Innovation Thinking to structured operational routines, banks can resolve systemic "contradictions", such as increasing customer convenience without sacrificing compliance or reliability (Soares & Navas, 2023).

2.3.2 Organisational Ambidexterity and the Three Horizons

The integration of CI and Innovation Thinking represents Organisational Ambidexterity, the capacity to simultaneously manage exploitative (efficiency-driven) and explorative (discovery-driven) activities. Successful organisations do not treat these as "either/or" choices but as synergistic combinations. To manage these competing demands, this study draws on Penker's (2018) Three-Horizon Methodology:

Horizon 1 (H1): Incremental Innovation and CI that builds on existing business models to improve current performance.

Horizon 2 (H2): Creative expansion into new business areas or significantly modified service configurations.

Horizon 3 (H3): Radical breakthrough projects that explore revolutionary changes and completely new technologies.

The integration of these methodologies manifests as contextual ambidexterity, the organisational capacity to balance the refinement of "Horizon 1" (incremental innovation/CI) projects with the discovery of "Horizons 2 and 3" (radical/breakthrough) (Tushman & O'Reilly, 1996; Penker et al., 2018). Without this balance, banks risk "Horizon 1 entrapment," in which an overfocus on existing process efficiency leads to obsolescence when digital disruption occurs (Penker et al., 2018).

Consequently, the integration of CI and Innovation Thinking is framed as a Dynamic Capability (Teece, 2025). By "sensing" opportunities across the value chain, "seizing" them through resource mobilisation, and "transforming" the organisational architecture to prevent the re-emergence of silos, banks can achieve long-term resilience and superior innovation performance (Teece, 2025; Richards & Coetzee, 2026a). This synthesis ensures that quality management and innovative behaviours are embedded throughout the organisation's activities, fulfilling the requirements for a truly sustainable competitive advantage (Ahinful et al., 2025; Porter, 1985).

2.3.3 From Static Resource-Based View (RBV) to Dynamic Renewal

The Resource-Based View (RBV) posits that organisations possess bundles of tangible and intangible resources that provide a sustained competitive edge if they are Valuable, Rare, Inimitable, and Non-substitutable (VRIN) (Ahinful et al., 2024; Barney, 1991). While the RBV explains the state of an organisation's assets, it is fundamentally a static theory. In volatile environments such as modern banking, merely possessing VRIN resources is insufficient, as these assets can become obsolete as market demands and technological paradigms shift. Consequently, the bank must be able to renew its resource base through continuous learning and reconfigure its assets to ensure long-term prosperity.

2.3.4 Dynamic Capabilities Theory (DCT): The Analytic Split

Building on the RBV, Dynamic Capabilities Theory (DCT) defines the organisation's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments (Teece, 2025). A critical theoretical advancement is the analytic split between two distinct classes of capabilities:

- **Ordinary Capabilities (Operational/H1 focus):** These are the static routines or "administrative" functions required for the bank to "make a living" by performing a fixed

group of activities with technical efficiency. CI methodologies (for example, Lean, Six Sigma, 8D) reside here to optimise these routines through variance reduction and stabilisation.

- **Dynamic Capabilities (Strategic/H2–H3 focus):** These are "higher-order" capabilities that determine how the organisation will compete and survive in the future. They are disaggregated into three primary clusters or micro-foundations:
 - Sensing: Identifying and assessing threats, opportunities, and latent customer needs.
 - Seizing: Mobilising resources and designing business models to capture value from discovered opportunities.
 - Transforming: Ongoing organisational renewal to maintain alignment with the business ecosystem and avoid structural inertia.

2.4 Continuous Improvement (CI)

CI is a business strategy that involves ongoing process improvement through various problem-solving methodologies (Bhuiyan et al, 2006). CI is part of a company's culture that encourages all employees to seek more efficient and effective ways to deliver on their processes. Companies that implement CI realise multiple benefits, including improved customer experience, increased productivity, reduced costs, enhanced employee experience, and more (Bhuiyan et al., 2006).

Although many methodologies exist and are applied across different contexts, describing all available methodologies and tools is beyond the scope of this study. This section discusses the most frequently used CI methodologies as identified in the literature (Chapter 4; Lizarelli et al., 2023; Richards & Coetzee, 2026a). For example, Agile was identified as a CI methodology in the scoping review in Chapter 5, but was not among the most frequently applied methodologies for CI. Further, Agile is more widely used as a project management methodology and is rooted in principles aligned with CI strategies, such as lean thinking (Magistretti & Trabucchi, 2024; Schwaber & Beedle, 2002; Womack & Jones, 2003).

A complete list of CI tools is covered in Chapter 4: Scoping review, Addendum A. There are differing opinions on whether TOC is considered a methodology or a CI tool. While TOC serves as a broad philosophy, it is also frequently classified as a specific tool within the CI and TQM toolsets (Anvari & Anvari, 2023). Recent research emphasises that TOC is frequently integrated with other major methodologies, such as Lean and Six Sigma, to create a more robust and comprehensive framework for organisational change (Mohaghegh et al., 2021)

The section below discusses the CI methodologies.

2.4.1 Lean Methodology

The term “Lean” was coined by J. Krafcik in his article “Triumph of the Lean Production System” (Krafcik, 1988). Lean Thinking was developed in the Japanese automotive industry at Toyota. Lean identifies value-adding, non-value-adding, and waste (Shang & Low, 2014). Lean thinking has enhanced customer experience, reduced turnaround times, and increased output, making companies more competitive. Value-adding activities are those your customers are willing to pay for (Womack & Jones, 1996). Non-value-adding activities are those that your customer is not willing to pay for but are necessary for the company. Wastes are activities that do not add any value to the customer. The eight types of waste are Rework, waiting, over-processing, transportation, motion, inventory, skills, and over-production. The description of each waste, as defined by Taiichi Ohno (1998), is summarised in Table 2-2 below (Bonaccorsi et al., 2011).

Table 2-2: 8 Types of waste and description

Waste	Description
Rework	The product or Service was not delivered correctly the first time, according to the requirements.
Waiting	Waste from time spent waiting for the following process to occur.
Over processing	Waste relates to more work or a higher quality than what is required.
Transportation	Waste of unnecessary movement of information about goods.
Motion	Waste of unnecessary person movement.
Inventory	Waste resulting from excess products and materials that are not processed.
Skill	Waste due to the underutilisation of people's talent, skill or knowledge.
Over production	Making more products or services than the customer requires.

The methodology's primary focus is to reduce waste and increase value-adding activities in processes. (Fiorillo et al., 2021; Lizarelli et al., 2021; 2023).

The term “lean” was first used by Womack and Jones (2005), who followed the five principles below:

Defining value from a customer's perspective.

Mapping the process flow and indicating the value-adding, non-value-adding, and wastes as indicated in Table 2-2 above.

Create a flow that delivers customer value without waste that disrupts the process.

Pull production: Only what and when a customer requests a product or service.

Striving toward perfection through eliminating waste. (Amaro et al., 2020)

The Lean methodology uses the structured approach of the Deming cycle, the Plan-Do-Check-Act (PDCA) model. The PDCA is an iterative four-step method for continuous improvement based on the scientific method developed by Edward Deming in the 1950s. Refer to Figure 2-2 for the PDCA framework (Soares & Navas, 2023).

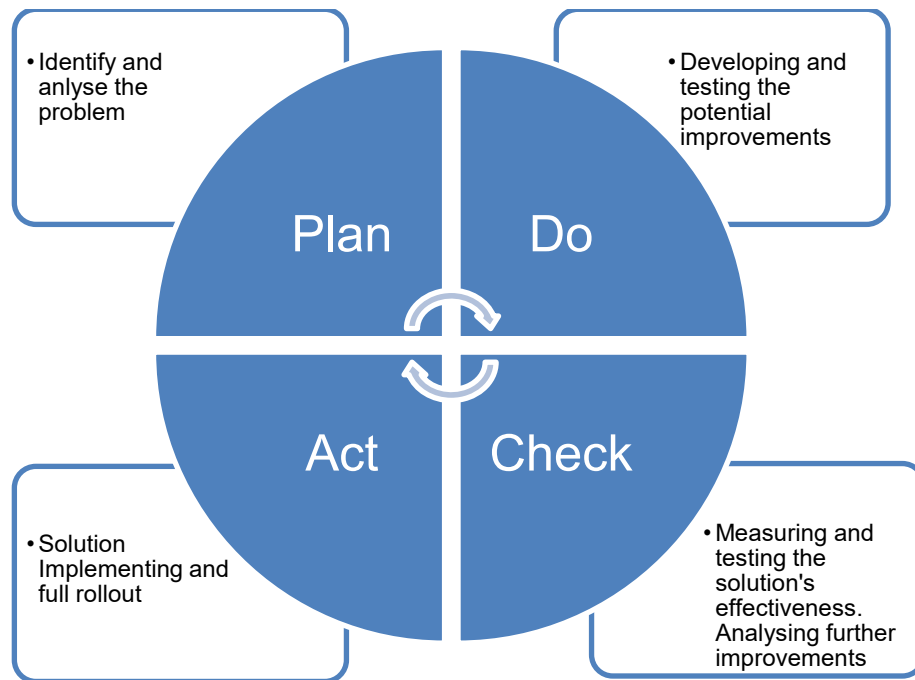


Figure 2-2: PDCA steps

2.4.2 Six Sigma Methodology

Six Sigma is a process-improvement methodology developed by Motorola to reduce variability in manufacturing processes (Zu et al., 2008). Six Sigma has a strong customer focus, focusing on the 'Voice of the Customer' and identifying customer needs. It is a data-driven approach that improves process efficiency and customer satisfaction. Six Sigma utilises the DMAIC (Define, Measure, Analyse, Improve, Control) framework. (Shaw, 2018; Sodhi et al., 2014; Teeling et al., 2023). Figure 2-3 below refers to the DMAIC framework.

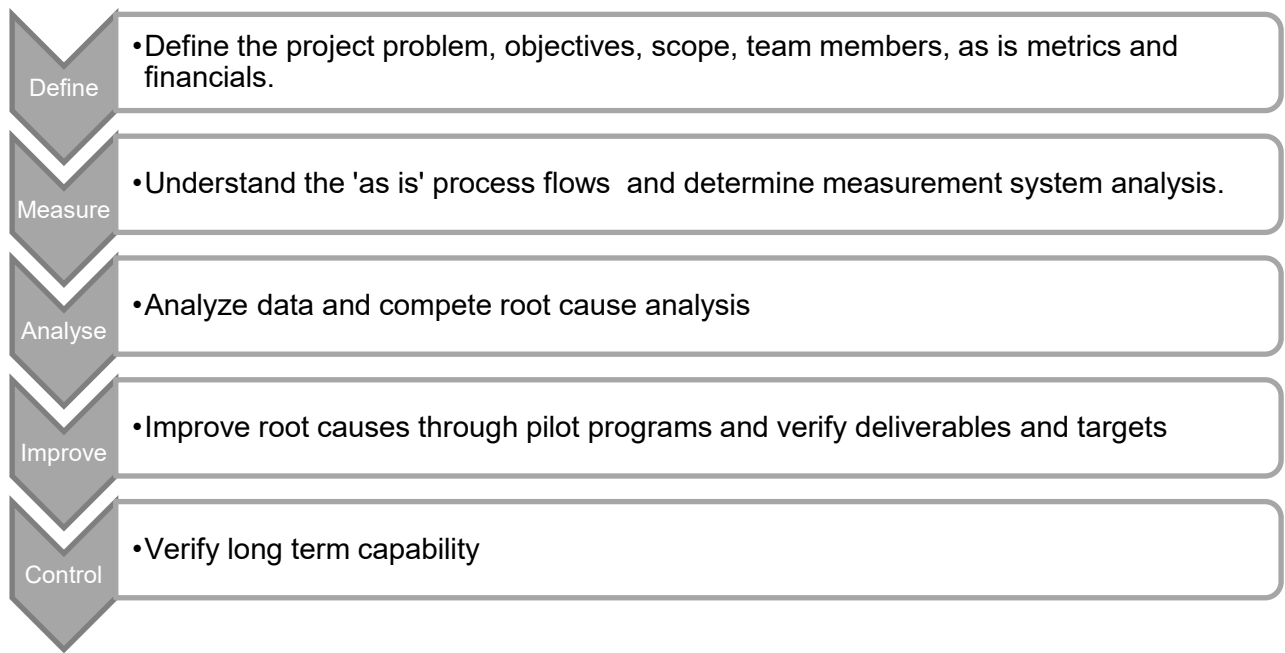


Figure 2-3: DMAIC steps

(Lizarelli et al., 2023)

Define

The project charter clearly outlines the problem and its objective statement. The team members, scope, and timelines need to be selected. The 'as is' financials and budget have been agreed upon. During this stage, the critical-to-quality (CTQ) and cost-to-quality (COQ) are defined and measured. The "Voice of the Customer" (VOC) is also determined.

Measure (M)

The measure phase involves gathering 'as is' through measurement system analysis of the metrics defined during the Define phase. Your team and management need to determine the targets for each metric. Project scope is mapped during this stage. Another popular tool used during this stage is the SIPOC, which indicates the process's Supplier, Input, Process, Output, and Customer.

Analyse (A)

The data collected during the Measure phase needs to be analysed using graphical analysis. The team needs to brainstorm causes for the problem using root cause analysis tools, such as the Fishbone diagram. The Fishbone diagram, also known as the Cause-and-Effect Diagram, helps the team identify all possible causes of the problem. Root causes need to be determined by data

analysis and tools, such as 5 Whys and cause-and-effect matrices. The 5 Whys is a root cause analysis tool that asks the question 'why' repeatedly until the root cause is determined. The cause-and-effect matrix helps identify and measure root causes.

Improve (I)

Process performance must be measured against targets agreed upon in earlier stages. Systematic tools, such as Design of Experiments (DOE), are used to study relationships among multiple variables and key outputs. Solutions for the root causes need to be implemented through pilot programs.

Control (C)

Control is the final phase in the Six Sigma DMAIC approach. The last phase ensures that the improved process stays in control through statistical process control (SPC). SPC is the application of statistical methods to monitor a process. The desired process results are monitored to ensure the process remains under control, and preventive measures are implemented. A handover plan needs to be followed. Control charts, audits, updating standard operating procedures, project closure and celebrating project success are all part of the Control phase. (Velu et al., 2021), (Lizarelli et al., 2023).

2.4.3 Lean Six Sigma Methodology

Lean Six Sigma combines the methodologies and tools of Lean and Six Sigma (Baker et al., 2015). Both methodologies are regarded as powerful frameworks for process improvement. Lean is usually the quick, low-hanging fruit project where the flow must be improved by eliminating waste. It is also referred to as incremental innovations (Penker, 2017). Six Sigma projects typically require more in-depth root cause analysis, analytics, and statistics. Some projects require a combination of both methodologies and tools. (Baker et al., 2015).

Table 2-3 indicates the overlap between the DMAIC of Six Sigma and the PDCA of Lean. (Teeling et al., 2023), (Lizarelli et al., 2023).

Table 2-3: DMAIC & PDCA overlap

PDCA	DMAIC
Plan	Define
	Measure
	Analyse
Do	Improve
Check	Control
Act	-

The Six Sigma methodology is used for projects that need to reduce process variation, while the Lean methodology is used for projects that need to improve flow and reduce waste (Soares & Navas, 2023). The tools and complexity differ for both methodologies, but the high-level outcomes of the methodology steps overlap.

The high-level outcomes of the Six Sigma methodology's "Define, Measure, and Analyse" steps are similar to the "Plan" step in the Lean methodology. The "Improve" step in the Six Sigma methodology overlaps with the "Do" step in the Lean methodology. The last step in the Six Sigma methodology overlaps with the "Check & Act" step in the Lean methodology.

2.4.4 8D Methodology

The 8D is a problem-solving methodology that originated during the Second World War and was developed by the US Government to assist in resolving issues with nonconforming material. Thereafter, the methodology was adopted by Ford Motor Company. The 8D methodology is a structured problem-solving approach that helps identify the root causes of a problem. It develops a short-term solution and then implements a longer-term solution to prevent the problem from recurring. One of the main objectives of the methodology is to identify the root causes of the problem and prevent similar issues from recurring for the customer. It is a structured approach to root cause analysis and problem-solving that addresses customer needs. Table 2-4 illustrates the steps of the 8D problem-solving methodology (Elangovan et al., 2021).

Table 2-4: The 8 disciplines of the 8D problem-solving methodology

Discipline 0 (D0)	Preparation: Plan for solving the problem and identify prerequisites
Discipline 1 (D1)	Identify a Cross-Functional Team: Establish a team that brings new perspectives and diverse ideas to problem-solving.
Discipline 2 (D2)	Problem description: Specify the problem through who, what, where, when, why, how, and now many.
Discipline 3 (D3)	Implement and Verify Short-Term Corrective Actions: Define and implement short-term actions to address the problem.
Discipline 4 (D4)	Root Cause identification: Identify all possible root causes of the problem. All potential causes should be verified.
Discipline 5 (D5)	Verify Permanent Corrections that will resolve the customer's problem: Use pre-production programs and quantifiable measures to confirm that the correction will resolve the problem.
Discipline 6 (D6)	Define and implement corrective actions: Define and implement the root causes of the problem. Validate the corrective actions against the problem identified.
Discipline 7 (D7)	Prevention of Problem Recurrence: Modify the procedures and practices to prevent the recurrence of similar problems
Discipline 8 (D8)	Team celebration: Recognise the team's collective efforts and formally congratulate all team members on the problems they have solved.

2.4.5 Total Quality Management (TQM)

TQM is another CI methodology that encompasses customer satisfaction, continuous learning, and experimentation. W. Edwards Deming was regarded as the father and developer of Total Quality Management (TQM) principles. TQM involves a continuous process of identifying and eliminating errors in manufacturing and service processes. Table 2-5 outlines the eight quality principles of Total Quality Management (TQM) (Anvari, 2022). (Lizarelli et al., 2023; Mohaghegh et al., 2021)

Table 2-5: TQM quality principles

Customer focus	Anticipating customer expectations
Leadership involvement	Active participation in TQM and not just monitoring.
Employee involvement	Include employees who are more than just participants, but who also experience a sense of pride and a quality journey.
Process-centric approach	Process improvement sees the company network as an interrelated process.
Continual efforts	Continuously improving and getting new ideas to improve processes.
Fact-based decision making	A data-driven approach to ensure that decisions are made based on data and not assumptions.
Supplier relationship	Assuring cooperation and mutual gain.

2.4.6 Total Productive Maintenance (TPM)

Total Productive Maintenance is a comprehensive maintenance system designed to eliminate waste associated with low equipment availability and failures (Mohaghegh et al., 2021). TPM is an approach that involves all employees in improving maintenance efficiency. It consists of 8 Principles, of which two pillars, Focus Improvement and Quality Management, are part of CI. Focused Improvement is similar to the Kaizen principles, which were developed from the Japanese philosophy of implementing minor, continuous improvements. Quality Management is about reducing defects to increase efficiency and improve customer satisfaction. (Elangovan et al., 2021; Mohaghegi et al., 2021). TPM is categorised as a "hard" or technical practice within the broader Lean management system, alongside Just-in-Time (JIT) and Total Quality Management (TQM) (Mohaghegh et al., 2021). It acts as a cornerstone of Lean Thinking, providing a stable foundation for operational excellence (Yasar et al., 2019).

In practice, TPM involves integrating maintenance processes into everyday operations to prevent breakdowns and reduce unexpected manufacturing errors (Fiorello et al., 2023). Typical practices identified in the sources include:

Autonomous Maintenance: Programs where operators take responsibility for the basic upkeep of their own equipment (Mohaghegh et al., 2021).

Planned Maintenance: Regularly scheduled inspections, cleaning, and upkeep of machinery to ensure peak efficiency (Mohaghegh et al., 2021; Fiorello et al., 2023).

Record Keeping: Maintaining excellent records of all maintenance-related activities and sharing them on the shop floor to promote active participation among employees (Mohaghegh et al., 2021).

2.4.7 Agile

Agile is defined as a development philosophy and management approach that prioritises flexibility, collaboration, and rapid iteration to meet evolving customer needs (Abrahams et al., 2023; Egieya et al., 2024). Unlike traditional "waterfall" development methodologies, which follow a linear and stage-gated path, Agile utilises an iterative cycle of planning, development, testing, and deployment (Abrahams et al., 2023; Aripin, 2024). Its specific application often depends on whether the organisation focuses on task execution or long-term organisational learning (Magistretti & Trabucchi, 2024).

2.4.8 Senge's Fifth Discipline

Senge's Fifth Discipline is a framework from the business literature utilised to manage disparate information and knowledge flows, ensuring continuous improvement (Senge, 1990). Unlike individual-focused methodologies, this methodology promotes a learning perspective that operates at the organisational level (Senge, 1990). This framework is used to inform the design of information systems, ensuring they intentionally facilitate learning and high-quality outcomes (Senge, 1990).

2.4.9 Relative Competitive Quality Advantage (RCQA)

Within the integrated management literature, RCQA is recognised as a specific CI methodology or framework for assessing a firm's strategic positioning. The key aspects of RCQA identified in the sources include:

- **Definition and Scope:** Evaluates the degree to which an organisation's quality management practices provide it with a superior edge over its competitors (Agyabeng-Mensah et al., 2020).
- **Relationship with Lean Management:** Research has utilised RCQA to investigate the combined influence of lean management and environmental practices on an organisation's overall performance (Agyabeng-Mensah et al., 2020).
- **Performance Impact:** The methodology serves as a lens for determining how high-quality standards, when compared with industry peers, translate into sustainable competitive advantage and improved business results (Agyabeng-Mensah et al., 2020).

2.4.10 Relative Proximity Theory (RPT)

Relative Proximity Theory (RPT) is a measurement tool and continuous improvement (CI) methodology used to evaluate the functional quality of service operations, particularly within higher education. It extends the Theory of Transactional Distance to identify specific obstacles that prevent a student from fully engaging with a course (MacLeod et al., 2019; Moore, 1993). RPT is frequently integrated into the Plan-Do-Study-Act (PDSA) cycle to facilitate the ongoing optimisation of teaching methods (MacLeod et al., 2019).

2.5 Innovation Thinking

Innovation Thinking involves introducing new or improved products or services to the market. Aligned with ISO 56002:2019, innovation is defined as the realisation of value from a new or changed entity. This study views innovation through a systems approach, in which leadership, culture, and resources are interrelated elements that drive organisational development. Innovation can be categorised into two types: radical and incremental innovations. Radical innovations are groundbreaking improvements and new distributional changes that can enhance process quality and company performance (Coccia, 2017). Incremental innovations are minor improvements to existing processes that help companies enhance their competitive edge and customer experience (Soares & Navas, 2023). The most frequently used Innovation methodologies are Ariz/Triz, Design Thinking, Creativity, Kano, Eco-Compass, and Action Research. (Richards & Coetzee, 2026a).

Within the framework of CI and Innovation, Value Engineering and Value Analysis are recognised as systematic methods for enhancing the value of products and processes by balancing their functions against their costs. (Lizarelli et al., 2023; Tohidi & Jabbari, 2012). Value Engineering is a methodology focused on reducing costs and/or increasing the functionality of a product (Koc et al., 2023). Value analysis is applied across different stages of the innovation process:

1. **Identification:** Identifying unmet customer needs or opportunities to create new forms of value (ISO 56002, 2019).
2. **Solutioning:** Using tools like rapid prototyping to make ideas tangible at a minimal cost (Brown, 2008). This allows for "failing fast," which often results in lower costs and increased organisational learning (Dell'Era et al., 2020).
3. **Standardisation:** Once a high-value solution is identified, it is standardised to prevent the recurrence of waste and to ensure consistent execution across the organisation (Henrique et al., 2021)

The section below discusses the Innovation methodologies. A complete list of CI tools is covered in Chapter 4: Scoping review, Addendum A and Addendum B.

2.5.1 Design Thinking

Design Thinking is a human-centred design process that bridges the gap between customers and businesses. It is a non-linear, iterative process that begins by prioritising customers' needs and offering a range of solutions to enhance their product or service experience. Design thinking dates back to the 1950s and 1960s in the fields of architecture and engineering. Applying the methodology leads to better business performance and a better customer experience. (Buhl et al., 2019; Lazo-Amado & Andrade-Arenas, 2023).

The methodology consists of five stages, as indicated in Table 2-6. (Lazo-Amado & Andrade-Arenas, 2023),

Table 2-6: The five stages of Design Thinking

Empathise	The problem is identified by empathising and understanding the customer's needs. Different research methods can be used to understand your customer needs: • Interviews and surveys • Observation studies • Empathy mapping • Customer journey mapping
Define	The main problem needs to be clearly understood by the user as a clear, actionable problem statement. Solutions that must interact with customers. The problem statement should be customer-focused, avoiding assumptions, and provide clear directions.
Ideate	Based on the problem definition, identify the best solution for the customer. The ideation phase is about exploring new possibilities. The following approaches can be used to improve creativity: • Brainstorming: Teams generate as many ideas as possible, without judgment. • Mind mapping: Visualising connections between ideas.
Prototype	A design that visualises the solution required by the customer. Prototypes can vary in complexity depending on the stage: • Low-fidelity prototypes: Referring to quick, inexpensive role-playing scenarios. • High-fidelity prototypes: Referring to more interactive and detailed models.
Testing	Meet customer satisfaction with a stable prototype for development. This phase involves testing the solutions to ensure they meet customer needs and effectively solve the problem.

2.5.2 Ariz/Triz

TRIZ is a Russian acronym invented by Genrich Altshuller during the early 1940s. TRIZ, which stands for Theory of Inventive Problem Solving, is a knowledge-based, systematic methodology (Li et al., 2014). It fosters creativity and innovation in problem-solving. ARIZ is a Russian acronym for "Algorithm for Inventive Problem Solving," a method developed by Genrich Altshuller, the founder of TRIZ. ARIZ links the TRIZ tools and techniques in a structured manner, thereby supporting each other (Moussa et al., 2019; Boavida et al., 2020; Hartono et al., 2019).

In the banking sector, TRIZ is utilised as a systematic methodology to foster innovation and resolve complex service contradictions (Wang & Chen, 2010). It is specifically integrated into the "Improve" phase of a Lean Six Sigma (LSS) DMAIC process to enhance traditional brainstorming, which can be inadequate for generating creative solutions (Wang & Chen, 2010). TRIZ enables banks to move beyond simple trial-and-error to achieve ideal final results without contradictory requirements (Boavida et al., 2020; Moussa et al., 2019). The integration of TRIZ into the banking process yielded significant improvements (Wang & Chen, 2010).

The TRIZ methodology follows four stages, as indicated in Table 2-7 (Moussa et al., 2019; Boavida et al., 2020; Hartono et al., 2019).

Table 2-7: The four stages of TRIZ

Define the problem	The problem needs to be clearly defined and measured during the early stages of the project.
Generalised problem to matching problem	Tools like the contradiction matrix are used to analyse the identified contradictions. This helps identify relationships to other inventive principles.
Generalised solution to the solve for problem	The inventive principles are used to generate potential solutions.
Use the identified solution to solve the original problem (Validation/Evaluation)	The proposed solutions are validated (evaluated), and during the validation (evaluation) process, the most promising solution is selected for implementation.

2.5.3 Eco-Compass

Eco-Compass is a methodology used in conjunction with TRIZ/ARIZ to systematically obtain process and system solutions, thereby improving the sustainability of innovation (Boavida et al., 2020). The following steps are followed for the Eco-Compass process:

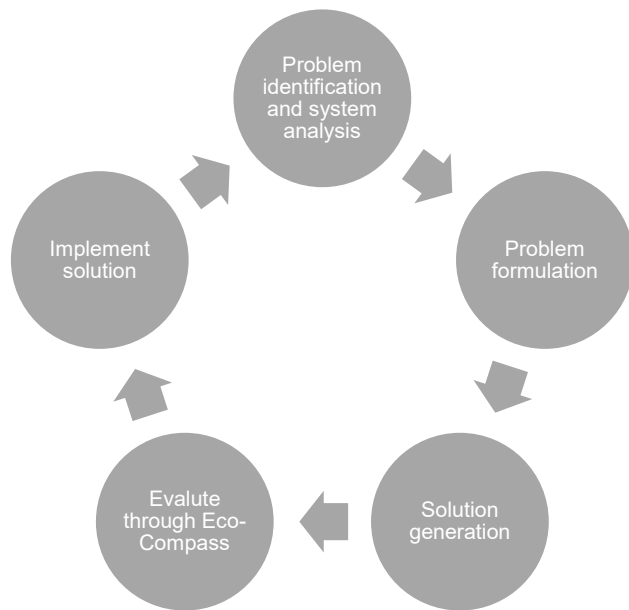


Figure 2-4: The five stages of Eco-Compass

2.5.4 Action Research

Action research is defined as a “global family of related approaches that integrate theory and action” with the primary goal of addressing significant organisational, community, or social issues in collaboration with those who directly experience them (Coghlan & Brydon-Miller, 2014). It is a research methodology focused on diagnosing practical problems through a lens of continual review, development, and change (Hazelton & Haigh, 2010; Paisey & Paisey, 2003, 2005; Williams et al., 2019). Unlike traditional research, where the researcher may be an outside observer, action research transforms the researcher into a partner, emphasising a more equal contribution to the inquiry between the researcher and the participants (Altrichter et al., 2002).

Action research is widely used in Innovation Thinking and serves as a primary vehicle for designing and implementing improvements in professional practice (Harris et al., 2010; Patrick et al., 2009).

2.5.5 Creativity

While innovation is the successful exploitation of new ideas to realise value, creativity serves as the underlying discipline that enables this process (Drucker, 2002; ISO, 2019). The innovation mechanism is generally divided into two stages: initiation (idea generation) and execution (implementation) (Axtell et al., 2000; Zaltman et al., 1973). Creativity is the driving force in the initiation phase, focusing on generating useful and novel procedures (Farr & Ford, 1990).

Creativity employs exploration-oriented tools that emphasise change and promote disruptive innovation rather than mere consistency (Asif & de Vries, 2015). To be effective, this creative

methodology should align with the broader strategic goals of the organisation to ensure ideas contribute to measurable business value (ISO, 2019)

2.5.6 Kano

In the context of innovation thinking, the Kano model is a methodology for prioritising the development of ideas and product features based on their impact on customer satisfaction (Anvari & Anvari, 2023). The model provides a framework for innovation thinking by distinguishing between different types of customer requirements (Asif & de Vries, 2015). To strengthen innovation thinking, the Kano model is often integrated into more complex, multi-tool frameworks. For example, researchers have proposed models that combine Kansei Engineering, Kano, and TRIZ to promote sustainable innovation in service operations (Hartono et al., 2019). This integrated approach allows organisations not only to identify what the customer wants (Kano) but also to systematically resolve the technical contradictions required to deliver those features (TRIZ).

2.6 CI and Innovation Thinking in the Banking Industry

Wild (2015) emphasised the importance of optimisation for South Africa in her book, *Innovation: Shaping South Africa through Science*. She noted that South Africa needs to find ways of doing things more effectively, optimise existing processes, and create new services and products that can compete economically. Wild (2015) indicated that optimisation is urgently needed to support the country's growth, particularly to ensure that economic progress is broad-based and resilient. This need is reinforced by the fact that the South African banking sector is currently undergoing an accelerated period of transformation driven by digitalisation, new regulatory requirements, and rising competition from Fintech and digital-only actors (Ahinful et al., 2025; Mhlongo et al., 2025). Wild (2015) emphasised the importance of optimisation for South Africa in her book, *Innovation: Shaping South Africa through Science*. She noted that South Africa needs to find ways of doing things more effectively, optimise existing processes, and create new services and products that can compete economically. Wild (2015) indicated that optimisation is desperately needed for the country's growth. The need for Organisational Ambidexterity in banking is exemplified by the rise of retail central bank digital currencies (CBDCs). Banks must decide between 'Direct' architectures, where the central bank handles all real-time payments, or 'Intermediated' architectures that rely on private intermediaries, representing a radical shift in the industry's digital infrastructure that requires high-order sensing and seizing capabilities (Vučinić & Luburić, 2022)

2.7 ISO Standards

ISO stands for the International Organisation for Standardisation, which is a worldwide federation of national standards bodies (ISO, 2015). Technical committees prepare these International Standards to establish requirements or guidance for various management systems and operational processes (ISO, 2015).

There are numerous ISO standards, but the ISO 9001:2015 Quality management and ISO 56002:2019 Innovation management standards were investigated for this study, as they were most closely related to continuous improvement and innovation.

ISO 9001 is a globally recognised standard that provides a foundation for continuous improvement by providing a structured framework for quality management systems (ISO, 2015). In practice, it checks the adherence to standards, including processes. Within Lean and continuous improvement paradigms, these standards are then tested and used to create new standards through the Plan-Do-Check-Act (PDCA) cycle, which forms the basis for rigorous continuous improvement.

ISO 56002:2019 is an international standard titled "Innovation management — Innovation management system — Guidance" (ISO, 2019). It provides a structured framework for organisations to establish, implement, maintain, and continually improve an innovation management system (ISO, 2019).

2.7.1 ISO 9001:2015 (Quality Management)

ISO 9001:2015 is an International Standard that specifies requirements for a quality management system (ISO, 2015). Organisations utilise this standard to demonstrate their ability to consistently provide products and services that meet both customer and applicable legal requirements (ISO, 2015). In practice, organisations often integrate ISO 9001 with other continuous improvement methodologies, typically Lean and Six Sigma, to achieve synergistic results. These methodologies leverage the ISO-required process approach: Lean uses the PDCA cycle to eliminate waste. At the same time, Six Sigma employs a data-driven approach and the DMAIC (Define-Measure-Analyse-Improve-Control) framework to reduce process variation (Soares & Navas, 2023).

It aims to enhance customer satisfaction by effectively applying the system, including processes for system improvement (ISO, 2015). The standard employs a process approach, which incorporates the PDCA cycle and risk-based thinking (ISO, 2015). This approach enables an organisation to plan its processes and ensure they are adequately resourced and managed (ISO, 2015).

The requirements are generic and intended to apply to any organisation, regardless of its type, size, or products and services (ISO, 2015). To maintain the system, the standard requires the management of support resources, such as people, infrastructure, process environment, and organisational knowledge (ISO, 2015). It also specifies requirements for competence, awareness, communication, and documented information (ISO, 2015).

2.7.2 ISO 56002:2019 (Innovations Management)

ISO 56002:2019 is an international standard titled "Innovation management — Innovation management system — Guidance" (ISO, 2019). It provides a structured framework for organisations to establish, implement, maintain, and continually improve an innovation management system (ISO, 2019).

Scope and Applicability include the following:

The guidance in the standard is generic and intended to apply to:

All types of organisations, regardless of type, sector, or size, including established organisations, temporary organisations, and start-ups (ISO, 2019).

All types of innovations, such as products, services, processes, models, and methods, ranging from incremental to radical (ISO, 2019).

All types of approaches, including internal and open innovation, as well as market-, technology-, and design-driven innovation activities (ISO, 2019).

The standard is founded on several fundamental innovation management principles (ISO, 2019):

- Realisation of value.
- Future-focused leaders.
- Strategic direction.
- Culture.
- Exploiting insights.
- Managing uncertainty.
- Adaptability.
- Systems approach (ISO, 2019).

ISO 56002:2019 utilises the PDCA cycle to enable the continual improvement of the innovation management system (ISO, 2019). The clauses are organised as follows:

Plan: Includes understanding the organisation's context (Clause 4), establishing leadership commitment (Clause 5), and planning innovation objectives and portfolios (Clause 6) (ISO, 2019).

Do: Covers support requirements, such as resources, knowledge, and tools, and the operation of innovation initiatives and processes (Clauses 7 and 8) (ISO, 2019).

Check: Focuses on performance evaluation through monitoring and measuring results against objectives (Clause 9) (ISO, 2019).

Act: Involves taking actions to continually improve the performance of the innovation management system (Clause 10) (ISO, 2019).

Operationally, innovation initiatives are implemented through processes that identify opportunities, develop and validate concepts, and deploy solutions (ISO, 2019). These processes are often non-linear and iterative, requiring flexibility to adapt to the specific types of innovations an organisation seeks to achieve (ISO, 2019).

The potential benefits of implementing an innovation management system in accordance with this guidance include increased ability to manage uncertainty, enhanced growth and profitability, reduced costs and waste, and improved sustainability and resilience (ISO, 2019). It also helps foster engaged and empowered people within the organisation and facilitates compliance with relevant regulations (ISO, 2019).

2.8 Conclusion

This Chapter outlined the CI and Innovation Thinking methodologies applied in this current study. This Chapter and the scoping review (Chapter 4) are both required to understand the existing CI and Innovation methodologies and their overlap. An in-depth understanding is needed to build and integrate a CI and Innovation thinking model.

CHAPTER 3 RESEARCH DESIGN

3.1 Chapter Orientation

This chapter is the third and last chapter of Section A. Following the research report structure, Figure 3-1 indicates the position of the current chapter. This chapter presents the research design adopted to achieve the study's objectives. The chapter outlines the research paradigm, design rationale, multi-phase approach, data collection strategies, data analysis methods, and ethical considerations.

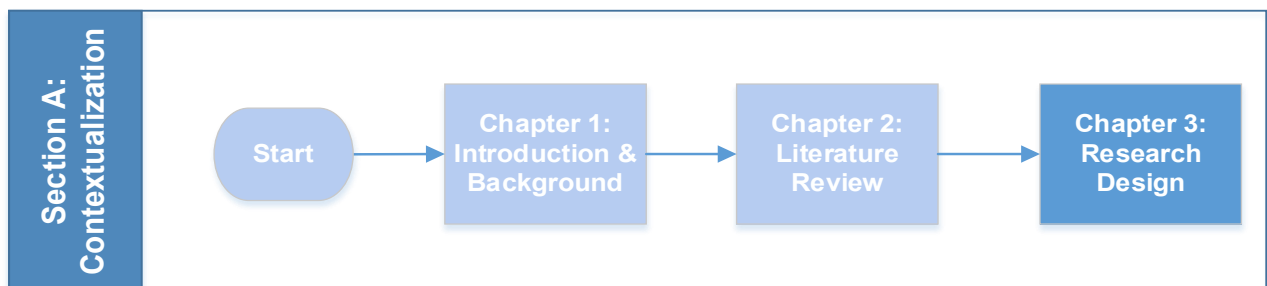


Figure 3-1: Report Structure: Research Design

This chapter outlines the methodological approach applied and the research design for the broader project. It contributes to the broader research project in several ways:

It justifies the Interpretivist paradigm used to explore the subjective organisational realities of practitioners within the case bank.

It details the four-phase DSR process that ensures the lineage of the final artefact is traceable and valid.

It establishes Dynamic Capabilities Theory (DCT) as the primary theoretical lens for sensing, seizing, and reconfiguring capabilities.

It provides the Trustworthiness Framework used to assess project quality in Chapter 11. The insights gained in this chapter were used to ensure that the development of the CII Integration Model was methodologically rigorous and theoretically grounded.

3.2 Researcher Positionality

3.2.1 Professional Identity, Research Journey, and Axiology

My positionality is rooted in over 20 years of experience as a Process Optimisation Specialist and a Master Black Belt in Lean Six Sigma, with a career spanning leadership roles across banking,

retail, and aviation. My personal journey provides the critical context for how I arrived at this research topic (Hampton et al., 2020).

Currently serving as the Business Process Optimisation Head at a South African bank, I am interested in this study because of a practical observation. While financial institutions excel at CI, they often struggle to integrate innovative thinking, which can erode their competitive advantage. This gap reflects my axiology, the values I bring to research, specifically, a belief in lifelong learning and the conviction that failure is not a permanent state but an opportunity for growth (Berkovic, 2023). These values align with my commitment to praxis, using research to engage in transformative actions that alter the status quo within the banking sector (Hampton et al., 2020; Pownall & Cordoba, 2026).

3.2.2 Reflections on Engineering and Qualitative Research

I approach this case study with an awareness of the inherent tension between my industrial engineering background and the qualitative nature of this research. Traditionally, engineering research is grounded in a positivist paradigm, prioritising objectivity and quantifiable causal relationships (Creswell, 2013; Kelly, 2011).

However, as this study delves into the socio-technical complexity of human behaviour and organisational systems, I recognise that purely quantitative methods would yield only a thin description of reality. Consequently, this study adopts an interpretivist approach, moving beyond the distance of a neutral observer to embrace the role of the researcher-as-instrument. By utilising Cooperative Method Development (CMD), I combine qualitative social science fieldwork with the engineering discipline's orientation to improvement (Daly et al., 2014; Kelly, 2011; Yip, 2023). This allows for thick descriptions that capture the cognitive, social, and experiential aspects of banking practitioners, which are often unattainable through quantitative methods alone (Yip, 2023).

3.2.3 Theoretical Orientation and Standpoint

My positionality is further informed by Dynamic Capabilities Theory, which views the integration of CI and innovation as essential meta-capabilities for sensing, seizing, and reconfiguring assets in a volatile market. This theoretical lens allowed me to view these two paradigms as complementary rather than opposing, aligning my personal belief in continuous growth with a robust theoretical scaffold for organisational renewal (See Chapter 2).

3.2.4 Insider Status and the Emic Perspective

In this qualitative case study, I occupy an "insider" (emic) position (Yin, 2018). My employment within the case study bank provided intimate knowledge of the organisation's culture and existing CI frameworks, facilitating rapport and a shared language during interviews. However, I recognise that insider status is a "double-edged sword"; it can lead to assuming answers rather than probing deeper, or to participants omitting details they believe I already know.

Furthermore, I am aware that my senior management position creates a power dynamic that could influence responses. To mitigate the risk of participants feeling obliged or pressured to respond, participation was strictly voluntary, and no direct reports were recruited. A third party in the organisation led the recruitment process to add a layer of protection for prospective participants. I also recognise my dual identity on a positionality continuum. At the same time, I am a professional insider, but I may be an outsider to participants' specific experiences across different departments (Yin, 2018; Yip, 2023).

3.2.4.1 Strategies for Limiting Bias and Enhancing Rigour

To safeguard the trustworthiness and confirmability of the findings, I implemented several rigorous strategies to identify and limit researcher bias:

Reflexivity and Bracketing:

I practised continuous reflexivity, explicitly noting my beliefs and interactions with the topic to remain impartial. I utilised bracketing to identify and set aside preconceived assumptions stemming from my Lean Six Sigma expertise, ensuring the final model was grounded in participant data rather than my own professional bias. Additionally, my notes after each interview were discussed with the fieldworker during debriefing and bracketing discussions.

Methodological Triangulation (Crystallisation):

To reduce individual researcher bias, I integrated data from four distinct lenses: a systematic scoping review, semi-structured interviews, a two-round Delphi study, and reflexive memoing.

Independent Fieldworker and Co-coding:

To maintain analytical distance, a fieldworker co-facilitated the interviews. Furthermore, an independent co-coder was utilised to code the data and participate in consensus discussions, ensuring that themes emerged directly from the data and not from researcher expectations.

Abductive Logic:

I employed abductive logic to infer explanations for surprises or anomalies in the data that could not be explained by existing theory alone (Szajnfarber & Gralla, 2017).

Member Checking and Collaborative Verification:

I utilised member checking, allowing participants to review transcriptions and initial findings to ensure they aligned with their intended meanings. The Delphi technique served as a final credibility check, allowing experts to critique and refine the model iteratively.

Pilot Testing:

Interview and observation protocols were piloted to ensure the questions were appropriate and neutral.

Audit Trail:

I maintained a transparent audit trail, documenting all decisions, raw data, and coding steps to ensure the consistency and dependability of the research process.

This process of making subjective interpretations transparent provides the clarity and credibility required for high-level qualitative engineering research, ensuring that the results are a robust reflection of organisational practice.

3.3 Research Paradigm

This study was guided by an interpretivist paradigm (Creswell, 2013), which assumes that reality is socially constructed and best understood through the meanings individuals assign to their experiences. Given the study's focus on understanding how CI and Innovation are practised and perceived within a particular organisational setting, this paradigm supported an exploration of subjective realities, organisational norms, and practitioner narratives.

3.4 Theoretical Lens

The Dynamic Capabilities Theory (DCT) (Teece et al., 1997; 2018; 2025) also informed the research, which emphasises an organisation's ability to integrate, build, and reconfigure internal and external competencies in response to changing environments. This theory provided a conceptual lens through which to view the integration of CI (incremental adaptation) and Innovation Thinking (strategic renewal) as dynamic capabilities necessary for long-term organisational performance.

The Dynamic Capabilities Theory (Teece et al., 1997; Teece, 2018) argues that long-term competitiveness depends on three meta-capabilities: (a) sensing environmental change, (b) seizing emergent opportunities, and (c) reconfiguring organisational assets. Applying this theory to develop an integrated CI and Innovation Thinking model is valuable for the following reasons. First, the DCT provides three activities to guide the integration of CI and innovation as a core capability by aligning their focus with strategic risk management. Second, it enables the integration of CI and Innovation methodologies and tools, allowing banking industry projects to explore innovative solutions to address evolving challenges. The three activities align well with the methodological steps discussed in Chapter 2. Third, the meta capabilities of these activities serve as design requirements for the proposed model (see Chapter 6).

Consequently, it offers a robust theoretical scaffold that enables the integration of continuous improvement methodologies and innovation initiatives into a model suited to the banking sector's fast-moving technological, competitive, and compliance landscape. The Value Chain is mapped to DCT's meta-capabilities. Sensing involves identifying functional quality gaps across discrete activities and their linkages (Porter, 1985; Teece, 2025). Seizing requires mobilising support activity resources (e.g., IT and HR) to capitalise on identified opportunities (Teece, 2025; Teece et al., 1997). Transforming entails reconfiguring the entire value chain, both primary and support, to prevent the return of organisational silos and ensure the bank remains future-ready (Teece, 2025). The application of this theory is presented in Chapter 6.

3.5 Research Phases

To address the research problem, the banking case study was conducted in different phases. To address each phase of the research process, this case study included a range of methods and source documents, as detailed in

3.5.1 Phase 1: Scoping Review

Building theory from case study research requires an in-depth exploration of the knowledge gap in extant literature. To understand how CI and Innovative Thinking initiatives could be integrated into a Bank, a qualitative scoping review (Chapter 4, Phase 1) was conducted to gain rapid, in-depth access to literature.

A scoping review is appropriate as it uses a systematic approach to peruse selected literature in a focused manner to answer a specific research question rather than exploring literature in general to provide an overall summary, as with other types of reviews (Daudt et al., 2013; Gough, Thomas, & Oliver, 2012). Therefore, a five-stage scoping review was conducted (Arksey &

O'Malley, 2005; Levac et al., 2010). This analysis phase occurred before the empirical study to help inform the empirical data collection process. The stages followed were:

- Identify the research question.
- Identifying the relevant studies
- Study selection
- Charting the data
- Collating, summarising, and reporting results.

More details on the Phase 1 method are available in the research paper presented in Chapter 4.

3.5.2 Phase 2: Individual Interviews and Root Cause Analysis

Qualitative data were collected to investigate the root causes of the lack of integration between CI and Innovation Thinking, and to explore how continuous improvement and Innovation Thinking could be integrated at the Bank. The data were gathered using semi-structured interviews, an accepted data collection method in case study research (Yin, 2014, 2018). These interviews allowed participants to share their opinions and experiences relating to the research questions (Tracy, 2019).

3.5.2.1 Data collection method

Semi-structured interviews. The researcher and an independent, qualified fieldworker conducted semi-structured interviews with research participants. The fieldworker signed a non-disclosure agreement to ensure compliance with ethical guidelines. The researcher and the fieldworker conducted debriefing sessions after each interview to ensure the consistent application of the research procedures described below.

The semi-structured questions to participants included:

Tell me about your experience with continuous improvement and innovative thinking in your institution.

What Innovation Thinking or continuous improvement methodologies and tools do you apply in your team?

How could continuous improvement and innovative thinking be integrated into your team?

What challenges do you envision in integrating innovative thinking and continuous improvement in your team?

How have you applied your continuous improvement training to improve innovation in your team?

What are the reasons and challenges for not combining the two methodologies?

How can an integrated model for continuous improvement and Innovation Thinking be implemented at your institution?

The complete interview guide is attached.

3.5.2.2 Population and Sampling

Participants were purposively selected for Phase 2 of the present study. Based on the ethical principle of distributive justice, participants in the chosen organisation had an equal opportunity to voluntarily participate in the research as advertised to all (see Gentles, Charles, Ploeg, & McKibbon, 2015).

Selection Criteria

The following criteria guided the participant selection. Participants were included in the study if they were:

18 years and older.

Employed at the case study Bank.

Willing participants who volunteer to share their opinions, experiences, and ideas on continuous improvement and innovative thinking, and who have signed informed consent forms.

Able to express themselves effectively in one of the following languages: Afrikaans and/or English*.

Have exposure to continuous improvement and innovation within their current work environment.

Certified as at least a Green Belt Lean Six Sigma.

Innovation exposure through Innovation courses and/or Innovation Representative for the Bank.

*If participants were willing to voluntarily participate in this study in one of the other official languages of South Africa, a translator was used to help translate their responses. To meet ethical guidelines, an independent department assisted with the recruitment process. Additionally, it was important to note that the researcher was not in a position of power, and prospective participants did not report directly to the researcher.

The recruitment process continued until enough participants were recruited to achieve data saturation (Tracy, 2019).

Additionally, the purposive sampling strategy for Phase 2 was structured using the DEJA (Define, Explain, Justify, Apply) tool to provide a transparent rationale for participant selection (Mthuli et al., 2021). A non-probability approach was defined and motivated the selection of 'key knowledge holders' (in this study, Innovation Representative and Green Belts) whose unique expertise was vital to the research problem (Kakar et al., 2023). The targeting of key knowledge holders also ensured that the sample possessed the high information power needed for a case study (Malterud et al., 2015). This justifies the sample of 13 as providing sufficient 'information power' for a qualitative inquiry focused on depth rather than statistical representation (Mthuli et al., 2021). Qualitative external validity is defined as transferability, which was achieved by providing descriptions of the banking context, allowing readers to judge the applicability of the findings to their own settings (Ahmed, 2024; Lincoln & Guba, 1985).

3.5.2.3 Data Analysis

The audio recordings of the interviews were transcribed, coded (validated), and then analysed using thematic analysis in ATLAS.ti software (version 25) (Braun & Clarke, 2014; Frieze, Soratto, & Pires, 2018). The analysis conducted concurrently with data generation, in a cyclical process (see Cresswell, 2013; Saldana, 2011, 2021), ensured the iterative process typical of case study research. It allowed the researcher to systematically develop conceptually sound research with logical coherence and data-driven rigour (Eisenhardt, 1989; Yin, 2018).

Table 3-1 details the analysis procedure that was followed in this study (Phases 2 and 4).

Table 3-1: Qualitative Analysis procedure

Qualitative Analysis (see Braun & Clarke, 2014; Cresswell, 2013; Saldana, 2011, 2021)	
Coding principles:	Strategies in ATLAS.ti 25
First level coding: Read, re-read data to familiarise	Preparation of data (transcriptions of voice recordings) and upload into ATLAS.ti 25. Organise data document groups (for example, participants 1-13; methodological groups (Scoping review/ interviews)
Inductive open coding	Initial inductive coding process The coding principles suggested here are based on iterative analysis using first and second-level coding (open coding, finding relationships between codes, identifying patterns, and presenting the research story) as described by Tracy (2019) and Saldana (2011, 2021). Initial coding processes: independent inductive co-coding; co-coding by an independent coder, consensus discussions; code-book

Qualitative Analysis (see Braun & Clarke, 2014; Cresswell, 2013; Saldana, 2011, 2021)	
Coding principles:	Strategies in ATLAS.ti 25
Second-level coding: Identify theme patterns Create initial themes Review and name final themes Produce report	development and stabilisation; consensus discussion; creation of themes and subthemes; review of themes and subthemes. The range of coding principles used to create a codebook based on Saldana (2011, 2021): Attribute codes (case number, type of method) (Friese, Soratto, & Pires, 2018) Simultaneous coding: capturing of complex descriptions of continuous improvement and innovation. Structural coding: creation of codes related to social, pragmatic, and academic ideas about continuous improvement and innovation. Structural codes provided organisational support for codebook domains. Value codes included references to implicit assumptions or ideals about integrating continuous improvement and innovation. Theming the data (longer code names) included descriptive phrases that explained the code segments (quotations). Codebook clean-up: merging, splitting, reviewing codes; independent external code-book review. Establishment of code-code relationships (code-co-occurrence explorer), viewing of code distributions. Exploring thematic patterns: drawing up networks to explore code-relations; interrogating code-relations using a query tool (Boolean operators). Drawing theme networks and re-evaluating data to interrogate and ensure themes (supported by smart codes, code groups, and sub-codes).

Three basic strategies for qualitative analysis informed the data analysis: (a) reduced the data into meaningful segments (Saldana, 2011, 2021), because it informed the research questions; (b) combining the created codes that formed broader categories or themes that relate well; and, (c) displayed and described the data in a way that allowed for the comparison of findings through networks or diagrams, tables, grids and discussions (Creswell, 2013; Saldana, 2011, 2021).

3.5.3 Phase 3: Development of Research Artefact

Following the case-study methodology, a research artefact was developed as a conceptual model in Chapter 7 to assist the Banking industry in practically integrating continuous improvement and innovation thinking in their teams. This artefact was developed through the comparative analysis of documents and the themes generated by the empirical investigation.

The integrated CI-Innovation model was developed through a Design Science Research (DSR) cycle that integrated three knowledge sources: a scoping review (Phase 1), interview data

(Phase 2), and theoretical framing (Dynamic Capabilities Theory, Section 3.4). The steps were based on DSR (Hevner et al., 2004):

1. **Extraction.** Patterns from the scoping review (Phase 1: Chapter 4), interview root causes (Phase 2: Chapter 5) and DCT's sense–seize–reconfigure activities were compiled in a single code book.
2. **Thematic grouping.** Codes were clustered into functional needs, banking-specific constraints, methodological tools, stakeholder roles, and enabling systems.
3. **Requirement drafting.** Each cluster was restated as a testable design requirement.
4. **Theory mapping.** Draft requirements were cross-checked against DCT to confirm theoretical coverage and against Phase 1 literature to ensure external validity.
5. **Iterative refinement.** Redundancies were removed, and wording was clarified based on supervisor feedback.
6. **Validation (Evaluation) readiness.** The final set of 18 requirements served as the design requirements for the Conceptual Model (Chapter 7) and as the validation (evaluation) benchmark for the Delphi study (Chapter 8).

To keep the list of requirements navigable, requirements were coded into five plain-language categories, each mapped to its dominant DCT activity. This is presented in Table 6.1 (Chapter 6).

3.5.4 Phase 4: Artefact verification and Validation (Evaluation)

The design requirements that were developed in Phase 3 (Chapter 6) were used to validate (evaluate) the model in this phase (Chapter 6).

The newly developed artefact was validated (evaluated) in Chapter 11, and it was confirmed that the integrated model meets the design requirements established in Chapter 6.

Once the research artefact was developed, participants were asked to verify the model's applicability in their specific departments.

The same data collection and analysis procedure was followed as in Phase 2 (see the Phase 2 method). Participants were central in developing the model to ensure its applicability to their organisation and specific department. Participants who were purposefully selected for this phase were asked to answer the following questions:

How can this model be applied in your department?

Do you see any implications of applying this model?

What suggestions will you make to improve this model?

After verification, the new integrated model was validated (evaluated) in Phase 4 (Chapter 11), and it was confirmed that the problem was addressed, confirming the study's quality, credibility, and contribution.

3.6 Trustworthiness Principles

For this study, several guidelines were applied to methodological coherence and to the research as a whole (Mayan, 2009). These guidelines were applied in line with Guba and Lincoln's (1994) trustworthiness criteria: credibility, transferability, dependability, and conformability. The study will be validated (evaluated) according to these criteria in Chapter 11.

The trustworthiness criterion and the principles that guided this study's trustworthiness are presented below.

Table 3-2: Trustworthiness criterion applied in this study

Trustworthiness criterion	Purpose	Relevant principle applied	Why was it applied?
Credibility (truth-value)	Credibility concerns whether the findings are a believable reflection of the data collection and analysis processes. The goal is to demonstrate that the research process was conducted with integrity and that the findings can be trusted (Enworo, 2023).	Peer review (articles submitted to journals). Member checking Researcher responsiveness Crystallisation	Guba & Lincoln (1994) propose peer review and triangulation to strengthen credibility. Crystallisation is a modern, multi-lens form of triangulation and is best suited to qualitative research projects (Tracy, 2010). Researcher responsiveness (ongoing reflexivity and member-like checking during data collection and analysis) ensures that interpretations of themes are grounded in participant data.
Transferability (applicability)	Transferability concerns the study's findings and their applicability to other research contexts (Enworo, 2023).	Conceptual coherence	A study that shows clear, internally coherent concepts and their relationships provides the "thick description" readers need to assess fit across settings (Tracy, 2023). Conceptual coherence, therefore, underpins transferability by encouraging

Trustworthiness criterion	Purpose	Relevant principle applied	Why was it applied?
			researchers to provide detailed descriptions of the research context, processes followed, and findings within that context.
Dependability (consistency)	Dependability concerns the consistency of the research process and the logical, traceable, and well-documented steps presented in the research report (Enworo, 2023).	Audit trail	Guba & Lincoln (1994) recommend a transparent audit trail (e.g., records of decisions, raw data, memos, coding steps) that could be presented to external examiners to assess the consistency of the process.
Confirmability (neutrality)	Confirmability demonstrates that findings flow from the data rather than researcher bias (Enworo, 2023).	Researcher responsiveness (as reflexive journaling) Audit trail	Confirmability relies on a reflexive stance plus a traceable chain of evidence. The same audit trail used for dependability allows an external examiner to verify that interpretations are grounded in data. Additionally, peer debriefing and the use of an independent co-coder to code data (researcher responsiveness) help expose and manage potential bias (Tracy, 2023).

The principles used to meet the abovementioned criteria and ensure trustworthiness are the audit trail, conceptual coherence, member checking, peer review, crystallisation, and investigator responsiveness (Finlay, 2006; Krefting, 1991; Mayan, 2009; Tracy, 2010). The principles and their application in this study are presented below.

3.6.1 Audit trail

To ensure dependability, a comprehensive audit trail was maintained to document all theoretical, methodological, and analytical choices (Nowell et al., 2017). This process allows an external examiner to trace the research decisions from raw data to final themes, ensuring the study is transparent and the findings are traceable (Ahmed, 2024). An audit trail is a record of the research process applied to ensure the traceability and the transparency of the study's application of qualitative research principles (McLeod, 2024). The goal of an audit trail is to provide a detailed account of how the study was conducted from the development of the research question to the final conclusions. The audit trail documents the steps followed in the research process, from

participant recruitment through data collection to data analysis. The steps followed in this study are also presented in this research report. The researcher aimed to present a clear and coherent description of the research process, with an audit trail to demonstrate the study's theoretical rigour (Finlay, 2006). In this study, the proposal development, ethical approval, recruitment, data collection, and analysis process documents are available to support the rigorous application of the qualitative research methods. The complete audit trail is available on a USB drive.

The audit trail is organised into sections that correspond to the report's chapters. First, the rationale and the relevance of this study are presented in Chapter 1. The study's justifications and underpinning theories are presented in Chapters 1-3. Additionally, the methods applied are presented in this current chapter. The process's dependability and confirmability are confirmed in Chapter 11.

3.6.2 Conceptual coherence

Conceptual coherence is understood as the interconnection among the literature and theories applied in the study, the research question, design, and methods, the data analysis procedures followed, and the interpretation of the findings (Mayan, 2009; Tracy, 2010).

In this study, care was taken to align the literature, the research question, the methods used, and the analysis and interpretation of the data. Three qualitative data-gathering methods (Scoping Review, Delphi technique, and interviews) were used to provide rich, detailed descriptions of the application of continuous improvement and innovation. An independent qualitative co-coder ensured that bias was limited and that the data were interpreted in line with the research questions by independently coding sections of the data, taking part in inter-coder reliability checks and consensus discussions (Frieze, Soratto, & Pires, 2018).

3.6.3 Member Checking

Member-checking is a technique utilised to establish trustworthiness (equivalent to validity in quantitative studies) and to provide credibility to the data (McKin, 2023). It allows the researcher to share transcriptions and initial findings with participants to ensure they align with the perspectives they expressed during data collection.

The semi-structured interviews in this study enabled member checking, as participants could provide feedback and clarify information (Tracy, 2010). First, participants could review the transcripts of their interviews to ensure their accuracy. Second, participants were active contributors to conceptualising and verifying the suggested model through the Delphi technique.

Furthermore, bias was limited, as qualitative researchers (the primary researcher and an independent research consultant) were part of the research process (crystallisation), and the research findings were peer-reviewed (Krefting, 1991). Additionally, a final credibility process was introduced to reduce potential bias using the Delphi technique. The model was shared with participants to critique and to provide suggestions for improvement. These improvements were triangulated with the literature (Phase 1 Scoping review), the interview data (Phase 2), and relevant theory (Dynamic Capabilities Theory).

3.6.4 Researcher Responsiveness

The researcher consistently aimed to be responsive at all stages of the research, demonstrating integrity and transparency while being conscious of their own bias. All research processes were captured in the audit trail and described in detail in this thesis. This is also in line with thick description as discussed in Tracy (2010). Thick description refers to a detailed description of actual behaviour, sufficient to permit the reader to see below surface appearances by offering an understanding of underlying patterns and context that give the information meaning (Leeds-Hurwitz, 2015).

3.6.5 Crystallisation

The study further adopted a crystallisation strategy to enhance credibility, combining four complementary methods to ensure a well-rounded view. Crystallisation is a form of triangulation that suggests viewing research problems from different lenses (Tracy, 2010). This triangulation of methods corroborates findings from different angles, reducing individual investigator bias and increasing the truth-value of the results (Fusch & Ness, 2015).

In this study, the semi-structured interviews were conducted with an independent researcher present; the transcripts were then co-coded by the independent researcher, and coding discrepancies were resolved by consensus. A multi-round Delphi panel confirmed emerging ideas against expert opinion, while a systematic scoping review situated these insights into the broader literature. As part of the crystallisation principle, the trustworthiness of this study was reinforced through reflexive memoing (reflecting on ideas during data collection and data analysis), peer debriefing (reflecting on ideas and bias with the interviewer and co-coder), and a documented audit trail. Together, these measures provided multiple lenses on the topic, supporting credible findings.

3.6.6 Peer review

Additionally, the study's findings were presented in articles from Phases 1 and 2 of the research process, which were peer-reviewed as part of the publication process. The above principles are

standard guidelines for all qualitative research. These principles are aligned with the trustworthiness validation (evaluation) criteria in Chapter 11.

3.7 Ethical Considerations

3.7.1 Procedure

Ethical clearance was obtained from the North-West University Engineering Research Ethics Committee (NWU-ENG-REC). The necessary permission to conduct the case study at the research site was obtained (Permission letters were shared with the Ethics Committee). First, a scoping review was undertaken to establish the rationale for this study as a whole (Chapter 4).

For the second phase of the research process, gatekeepers were contacted and asked to invite prospective participants to an online information session. During the information sessions, the researcher explained the research goal and what was expected of participants, and answered any questions prospective participants had about the study or the research process. Respect was shown to all prospective participants. Therefore, prospective participants received informed consent at least one week before the data-gathering day and were free to contact the gatekeepers with any questions during this time. Researchers provided prospective participants with the dates.

On the different data-gathering days, the study's aims and objectives, and what would again be expected of participants, were explained. A fieldworker (a trained qualitative researcher) received formal training in obtaining informed consent in accordance with ethical and institutional guidelines, and then obtained informed consent from participants. Participants were informed that participation in this study was voluntary and that they could withdraw at any stage during the research process without any prejudice or negative consequences. Participants were told they could contact one of the researchers to withdraw.

Semi-structured interviews were conducted with participants who voluntarily agreed to take part. Before the interviews, the research aim was explained again, and participants had the opportunity to ask questions about the research process. Prospective participants had multiple opportunities to discuss their questions and concerns with the researchers prior to data collection. Willing participants took part in an in-depth interview at mutually agreed-upon dates and times. Participants were informed of the interview duration and that it would be recorded before they gave consent. The researchers discussed the data management plan and confidentiality safeguards with participants who were uncomfortable with the interview being recorded.

The interviews were conducted via MS Teams to ensure easy, safe access.

3.7.2 Gatekeepers

A designated employee of the participating banking institution served as a gatekeeper, introducing the researcher to prospective participants.

3.7.3 Fieldworkers

The researcher collected data, and a fieldworker competent in qualitative research methods conducted individual interviews with participants. The fieldworker was a qualified qualitative research consultant, specifically trained to conduct individual interviews and obtain informed consent from prospective participants. The fieldworker attended the prescribed ethical training. The researcher was the lead interviewer, supported by the fieldworker, who asked follow-up and clarification questions as needed. Both the researcher and the fieldworker attended all the interviews with thirteen participants.

3.7.4 Transcriptions and Co-coding

The textual data gathered were transcribed and co-coded by the researcher and an independent research consultant. The researcher began with open coding, and the independent research consultant subsequently completed open coding to compare the results. Meetings were held between the researcher and an independent research consultant to reach consensus on the work completed, in line with best and standard practices in qualitative research.

The researcher completed selective coding and identified patterns in the data, which an independent research consultant verified. This was an iterative data analysis process. The findings from each phase of the research were triangulated to ensure the rigour of the process and the trustworthiness of the findings.

The research consultant received training from the primary researcher before commencing transcriptions and co-coding and was expected to sign a confidentiality agreement to ensure that participants' identifiable information was not made public. The confidentiality agreement is attached.

3.7.5 Anonymity and Confidentiality

Participants were assured that their identifiable information would be treated as confidential and that their names would not be used in any report.

3.7.6 Risks and Benefits

The study's potential benefits and risks are briefly discussed below.

3.7.6.1 Benefits

An artefact was developed during the study and presented to participants to help them integrate continuous improvement and Innovation Thinking.

This study potentially offered many benefits not only to the participating employees but also to the Bank. The employees in this study could expect their opinions to be heard and respected, and they were allowed to share their views on how they could improve their own applications of CI and Innovation Thinking in their workplace.

Participants' input was gathered during the interviews. A new integrated model was developed based on the feedback received and the learnings from the literature study and scoping review. The new integrated model was built and distributed to the participants through 2 Delphi rounds. The new inputs and concerns from participants were addressed after the first Delphi round and redistributed to all participants during the second Delphi round to confirm consensus. The bank and its employees (the participants) benefited from this study as the new integrated model demonstrated how to integrate continuous improvement and innovation in their teams. This could lead to reduced costs, increased productivity, improved customer and employee experience, and greater innovation and continuous improvement within the banking institution, all of which are required to stay competitive.

3.7.6.2 Possible Risks

The table below presents possible risks or discomforts and strategies to minimise them.

Table 3-3: Risk for Bank and Employees

Probable/possible risks/discomforts	Strategies to minimise risk/discomfort
1 Possible risk for employees	
Sharing experiences as an employee.	The employee's feedback stayed anonymous, and no other stakeholders had access to the participants' identifiable information.
2 Possible risks for the Bank	
The risk of intellectual property being used or shared.	An NDA (non-disclosure agreement) was signed between the University and the Bank. An NDA was signed between the data's fieldworker, transcriber, and co-coder to ensure confidentiality. The fieldworker was an established researcher with a doctoral degree and agreements with the University. The Bank's name was not used in any report and was only referred to as a banking institution. All data was stored on a password-protected shared drive, and only the doctoral candidate and her

Probable/possible risks/discomforts	Strategies to minimise risk/discomfort
	supervisor had full access to the shared drive. The fieldworker had limited access to the data during the research process's data collection and analysis phases.

3.7.7 Incentives and Reimbursements

Participants were not compensated for their participation in this study.

3.7.8 Data Storage

Electronic data were stored on a shared Google Drive, with only the principal investigators and the supervisor (as backup) having direct access to the information and raw data. The research consultant had only controlled access to the anonymised data uploaded to ATLAS.ti. Electronic data will be stored for 5 years and deleted thereafter.

3.7.9 Conflict of Interest

The primary research team was provided with a conflict-of-interest form to declare conflicts of interest.

3.7.10 Re-use of data

The data may be reused in further studies with a clear focus on continuous improvement and innovation in the banking industry.

Additionally, the three principles that are stressed in the Belmont Report (1979), namely: Respect, Beneficence, and Justice, were followed. All participants were informed that they could withdraw at any stage without any negative consequences.

3.8 Conclusion

This chapter outlined the research design employed in the study. Using a qualitative case study, guided by an interpretivist paradigm and dynamic capabilities theory, enabled a robust exploration of the integration challenges between CI and Innovation Thinking. The following chapters present the empirical results and the proposed integration model's development, validation, and implications.

CHAPTER 4 PHASE 1: SCOPING REVIEW

This chapter is based on a scoping review aimed at assessing the state-of-the-art literature integrating CI and Innovation Thinking across various industries, identifying gaps and highlighting their similarities and differences.

Title: Integrating Continuous Improvement and Innovation Thinking: A Scoping Review

Type: Scoping Review

Status: In Review – accepted with revisions.

The findings show that while many studies recognise the value of combining CI with Innovation Thinking, integration remains limited. Most articles focus on CI, which has clear methodologies, while innovation approaches are less frequently applied and often lack detailed implementation guidance. Moreover, previous research tends to address integration conceptually rather than through comprehensive, methodologically grounded frameworks, and there is a lack of research on underrepresented regions, such as Africa, and sectors such as banking.

4.1 Chapter Orientation

The report consists of 12 chapters and four sections. Figure 4-1 shows the chapter's position in the overall structure.

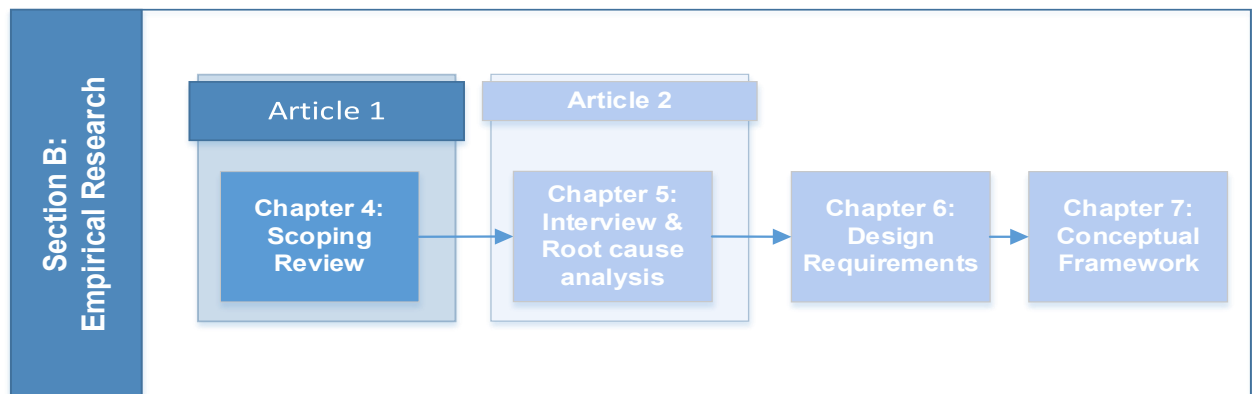


Figure 4-1: Report Structure: Scoping Review

As part of the broader research project, the scoping review serves multiple purposes:

It systematically identifies the existing CI and innovation methodologies used in organisations, highlighting prominent approaches such as Lean and Design Thinking.

It examines how these methodologies have been combined or integrated, addressing the critical issue of their lack of systematic integration.

It informs the development of the integrated Continuous Improvement and Innovation (CII) model by identifying methodological elements for a unified framework and ensuring the design is grounded in existing research.

Thus, the scoping review is a crucial step linking the conceptual framework from Chapter 2 to the model development and evaluation in subsequent chapters.

It is important to note that the article is formatted in accordance with the journal guidelines and therefore uses North American spelling.

4.2 Research question & Objectives

The research questions addressed by this chapter are as follows:

What is the country and industry distribution for continuous improvement and Innovation Thinking?

What methodologies are used for continuous improvement and Innovation Thinking?

What methodology steps are applied for continuous improvement and Innovation Thinking?

What is the overlap and integration between continuous improvement and Innovation Thinking?

The research objective addressed by this chapter is as follows:

To conduct a scoping review of extant literature regarding the continuous improvement and Innovation Thinking methodologies applied across countries and industries.

INTEGRATING CONTINUOUS IMPROVEMENT AND INNOVATION THINKING: A SCOPING REVIEW

Abstract

Purpose: This study aims to analyse the existing literature on Continuous Improvement (CI) and Innovation Thinking to explore the state-of-the-art methodologies and their applications across industries.

Design/methodology/approach: A scoping review was conducted to determine the state-of-the-art methodologies, vocabulary, and unique characteristics of both methodologies to address this issue.

Findings: Organisations must adopt methodologies promoting CI and Innovation to stay competitive in the current business landscape. However, companies focus more on CI projects, neglecting innovation projects and therefore not implementing both methodologies simultaneously, which can impact their competitiveness. The study identified gaps and illustrated the similarities and differences between CI and Innovation. The findings suggest that companies must balance their focus on both methodologies to ensure they are constantly improving and innovating.

Originality/value: This scoping review is the first to systematically examine the integration of Continuous Improvement (CI) and Innovation Thinking methodologies across sectors. It identifies the lack of structured integration models and proposes key insights for future implementation. By consolidating fragmented approaches, this study offers a valuable foundation for developing cohesive integration strategies to enhance organisational competitiveness.

Keywords: Continuous Improvement, Innovation, Scoping Review

Paper type: Scoping Review

Status: In Review

1. Introduction

To remain competitive in today's rapidly evolving global economy, organizations must continuously improve their operations while simultaneously innovating. Continuous Improvement (CI) methodologies, such as Lean and Six Sigma, support incremental optimization of existing processes (Yasar, 2019; Tohidi and Jabbari, 2012). In contrast, Innovation Thinking encourages more radical, creative solutions through new products, services, or business models. While these

approaches have traditionally been applied in isolation, combining them is increasingly essential for long-term organizational success (Yasar et al., 2019).

Penker et al. (2018) conceptualized this dual need through the three-horizon model, distinguishing incremental (H1), creative (H2), and breakthrough (H3) innovation. Although H2 and H3 are associated with strategic renewal and future growth, most companies remain trapped in H1, focusing heavily on CI and neglecting riskier, longer-term innovation projects. This imbalance, as noted by Antony et al. (2019) and Henrique and Godinho (2020), is reflected in scholarly work that frequently explores CI or Innovation Thinking separately, rather than in combination.

However, integrating CI and Innovation Thinking offers numerous benefits, including improved financial performance (Yasar et al., 2019), enhanced customer experience (Lizarelli et al., 2023), greater employee satisfaction (Albooshi, 2022), competitive advantage (Agyabeng-Mensah et al., 2020), and long-term sustainability (Lui et al., 2020; Mendoza-Arviso and Solís-Rodríguez, 2022). Despite these advantages, the literature lacks comprehensive studies on how to effectively integrate these methodologies.

This scoping review analyses how CI and Innovation Thinking are used and whether they are integrated in practice. Specifically, it explores publication trends, country and industry representation, methodological usage, the presence of integration models, and future research directions. The following research questions guide it:

- How are continuous improvement and innovation thinking methodologies currently integrated in practice?
- What gaps exist in the application and documentation of integration steps, tools, and frameworks?

The primary theoretical architecture for this review is Dynamic Capabilities Theory (DCT), which frames the integration of Continuous Improvement (CI) and Innovation Thinking as an essential meta-capability for survival in volatile markets (Teece, 2025). While traditional views treat CI and Innovation Thinking methodologies as separate, DCT posits that long-term competitiveness depends on an organization's ability to sense environmental shifts, seize opportunities, and reconfigure its asset base. A critical advancement is the "analytic split" between two classes of capabilities: Ordinary Capabilities (Horizon 1 focus) and Dynamic Capabilities (Horizon 2 and 3 focus) (Penker, 2018; Teece, 2025; Richards, 2026a). Ordinary capabilities encompass static routines optimized through CI methodologies such as Lean and Six Sigma, which ensure operational stability. Conversely, dynamic capabilities are higher-order functions that allow an organization to challenge the status quo and envision novel business models through Innovation

Thinking. Integrating these methodologies fosters contextual ambidexterity, preventing "Horizon 1 entrapment," in which overreliance on incremental efficiency leads to obsolescence in the face of radical disruption (Penker, 2018). In the South African context, this integration is a societal necessity to resolve the "usage paradox," in which high account ownership coexists with low digital literacy, by designing user-centred financial solutions that enhance financial inclusion (Mondato, 2023; Wild, 2015).

2. Research Methodology

A qualitative scoping review was conducted to systematically identify and analyse how Continuous Improvement (CI) and Innovation Thinking methodologies are integrated. The review followed the five-stage methodological framework developed by Arksey & O'Malley (2005) and incorporated the enhancements recommended by Levac et al. (2010) to ensure methodological rigour and transparency. This structured approach is aligned with the PRISMA framework (Moher et al., 2009) for reporting systematic reviews. This approach ensured methodological rigour and transparency in evaluating peer-reviewed literature.

The search strategy combined relevant keywords related to CI and innovation methodologies, frameworks, tools, and techniques. Keywords were selected based on a preliminary scan of interchangeable terms commonly used in the field. Searches were conducted within article titles and abstracts, yielding an initial pool of 331 publications. After removing duplicates, non-English and non-peer-reviewed sources, 85 articles remained for abstract and title screening. Following a thorough review of the full texts for relevance, 62 articles were included in the final analysis (see figure 1).

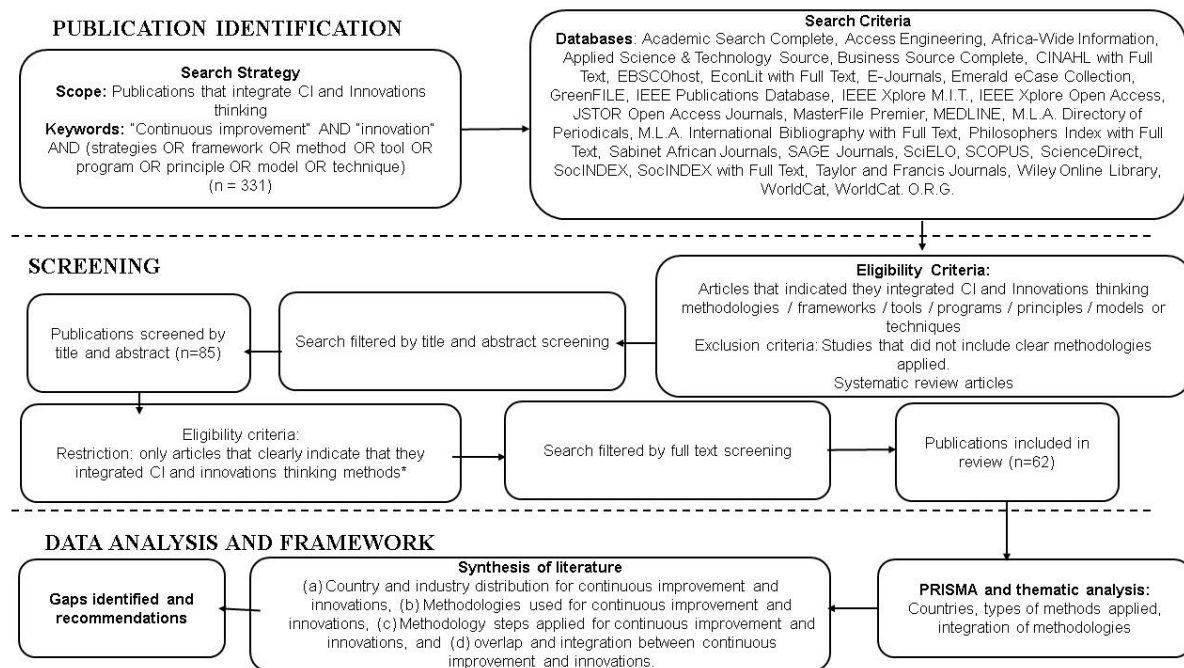


Figure 1 Overview of review methodology steps

The inclusion and exclusion criteria are indicated in Table 1 below for the article.

Table 1 Inclusion and Exclusion Criteria

Inclusions	Exclusions
Keywords: "Continuous improvement" AND "Innovation" And (strategies OR framework OR method OR tool OR program OR principle OR model OR technique) in the title and abstract	Articles that do not address the Continuous Improvement and Innovation methodologies
2019 - 2024	Before 2019
Peer reviewed	Grey literature,
English	Non-English
Articles that included clear methodologies applied	Articles that did not include clear methodologies applied

Articles were analysed according to integration themes, year of publication (Figure 2), country (Figure 3), and industry distribution (Figure 4). The review also examined which CI and innovation methodologies were used (Figures 5 and 6), their associated steps (Tables 2 and 3), and the extent of overlap or integration. finally, key gaps and lessons learned were identified to inform future research and practical application.

3. Findings

The PRISMA findings are presented in this section. The analysis process started with an in-depth reading of the chosen articles, followed by a literature synthesis to identify the theme. The themes are presented following the structure:

1. Country and industry distribution for continuous improvement and Innovations.
2. Methodologies used for Continuous Improvement and Innovations.
3. Methodology steps applied for Continuous Improvement and Innovations.
4. Overlap and integration between Continuous Improvement and Innovations.

Appendix C details the entire analysis process and how each article contributes to the themes.

3.1 Country and Industry Distribution for CI and Innovation

3.1.1. Year of Publication

The publications included in this study were found to have been published between 2019 and 2023. Most articles were published in 2020 (15 articles), followed by 2019 (13 articles) and 2021(13 articles). Figure 2 illustrates the year and number of publications.

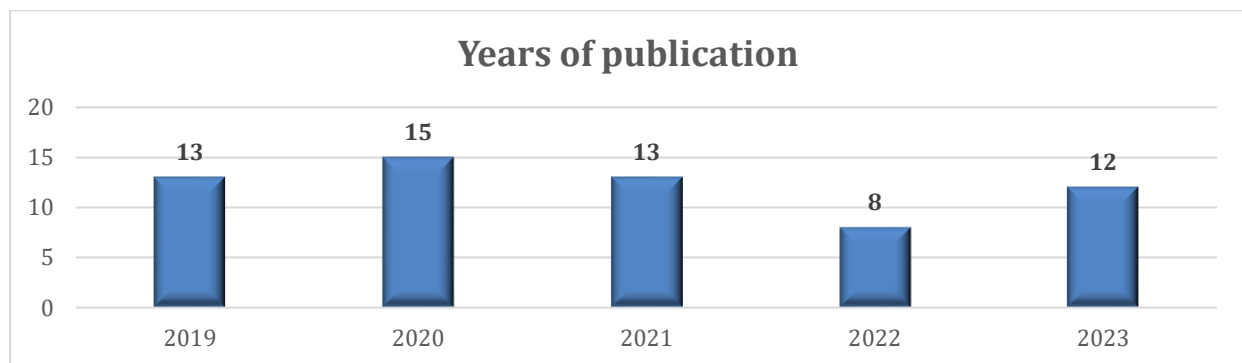


Figure 2 Years of publication.

3.1.2 Country distribution

Most articles originated from the USA and Europe, with limited contributions from Africa (see Figure 3).

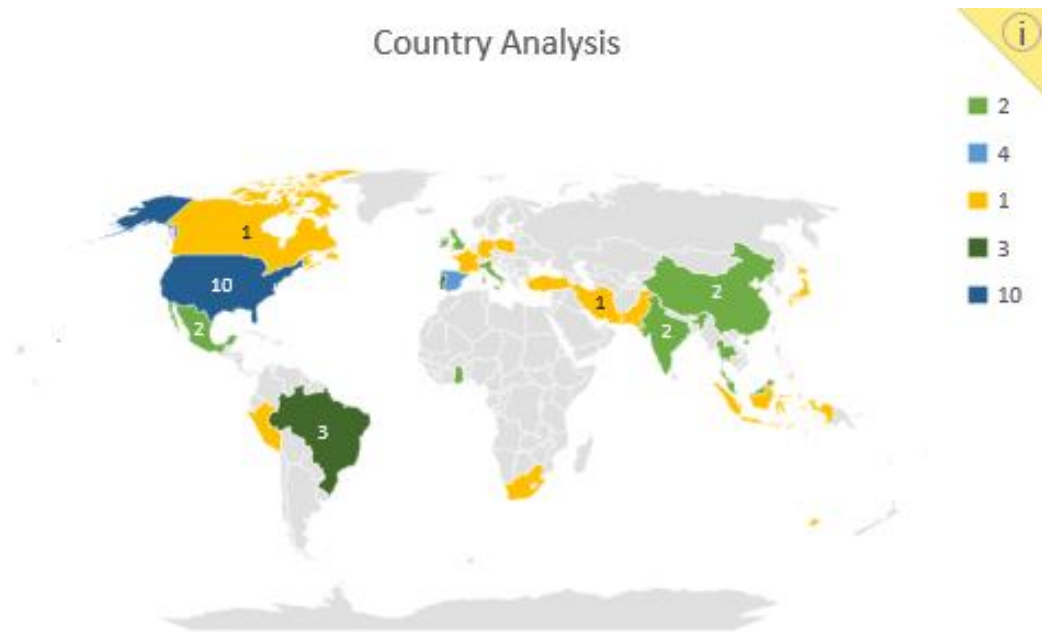


Figure 3 Country analysis.

3.1.3 Industry distribution

The industry distribution was analysed using a Pareto analysis. healthcare and manufacturing dominated the industry distribution, comprising 68% of the articles reviewed. education, engineering, logistics, and other sectors were also represented, but the financial industry was notably absent (Figure 4).

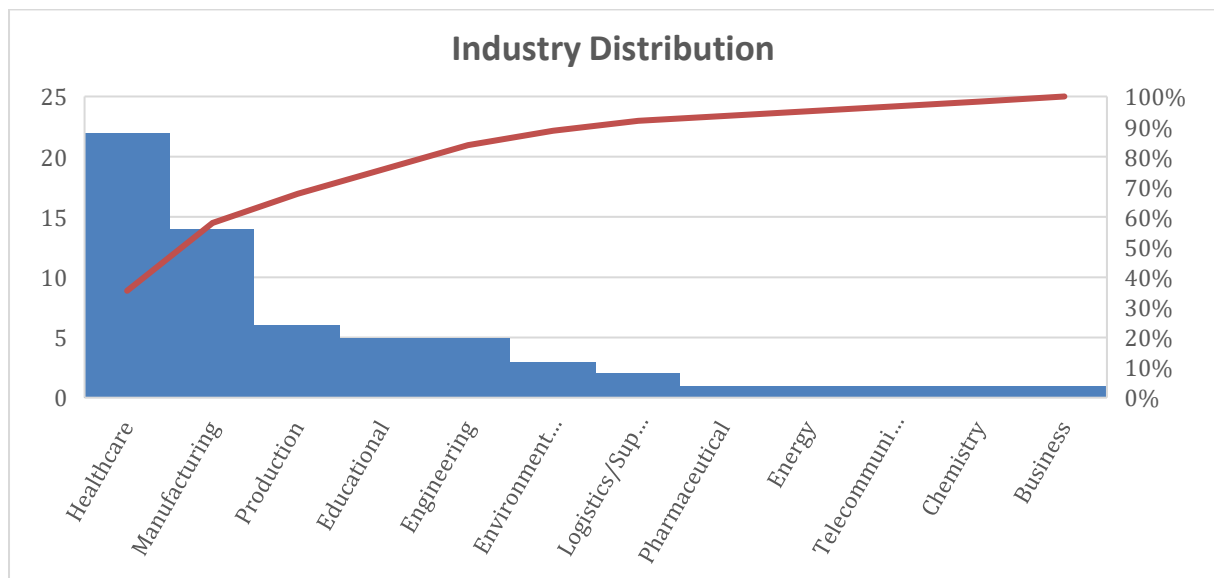


Figure 4 Pareto analysis for industry distribution.

3.2. Methodologies and Steps Applied for CI and Innovation

3.2.1 CI methodologies and steps

Lean Six Sigma was the most frequently used CI methodology, applied in 48% of the articles (30 out of 62). This hybrid approach combines Lean's focus on waste elimination and Six Sigma's emphasis on process variation reduction, using tools such as DMAIC and PDCA. Studies applying this methodology include Daly et al. (2021), Henrique et al. (2021), and Teeling et al. (2023).

Pure Lean methodology appeared in 32% of the articles (20 out of 62), particularly in manufacturing and healthcare settings. Examples include Soares and Navas (2023), Pusic et al. (2012), and Lizarelli et al. (2023), who focused on process flow and Kaizen-based cycles such as PDCA and PDSA.

Total Quality Management (TQM) was applied in 18% of the articles (11 out of 62), often combined with Lean or TPM. TQM practices drove culture change, customer focus, and continuous system-level improvement (Anvari & Anvari, 2022; Hammami et al., 2021).

Six Sigma alone was less frequently used (10%, or six articles), focusing on data-driven quality control through DMAIC steps (Gregory, 2020; Hamid et al., 2020; Velu et al., 2021).

Other methodologies included:

Total Productive Maintenance (TPM) was found in 6% of the articles (Elangovan et al., 2021; Mohaghegi et al., 2021)

Agile is used in 3% of the articles (Lazo-Amado & Andrade-Arenas, 2023)

8D applied in 2% of the articles (Elangovan et al., 2021)

Senge's Fifth Discipline and RCQA/Relative Proximity Theory are mentioned only once each (Pusic et al., 2012; Agyabeng-Mensah et al., 2020)

Many articles combined methodologies or selectively applied tools without implementing complete frameworks. For example, several studies used DMAIC without referencing the broader Six Sigma approach or cited Lean but implemented only selected tools (e.g., 5S, value stream mapping). A complete list of CI tools and the associated articles is provided in Table 1 and Addendum A.

The above findings indicate that the combined Lean Six Sigma, Lean, TQM and Six Sigma were the most clearly defined and frequently used. However, many teams used only specific tools when applying the Lean Six Sigma methodology, not the entire toolset for these methodologies.

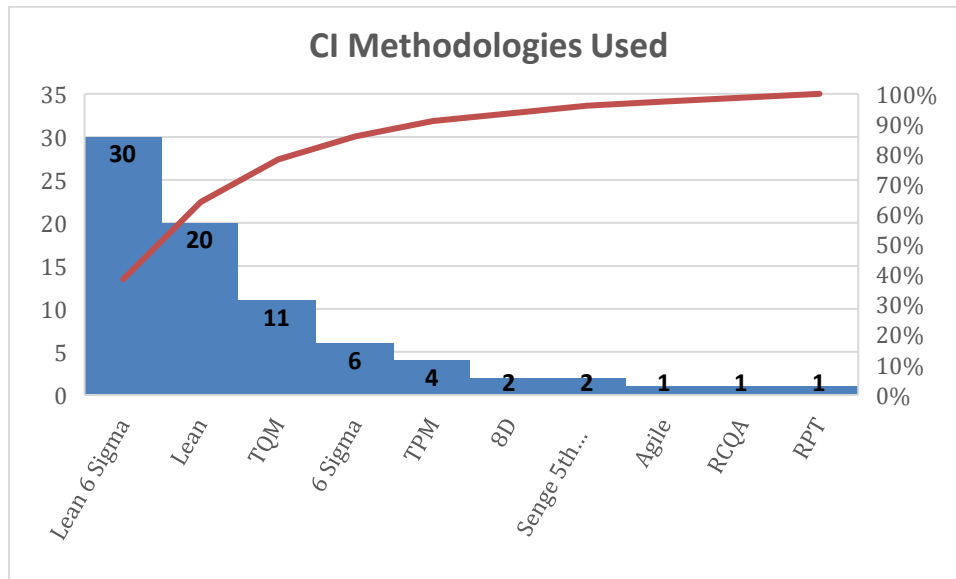


Figure 5 CI Methodologies

The CI methodology steps were analysed during this current study. Not all the methodologies applied had clear steps and were only referred to at a high level. However, Table 1 summarises the methodology steps mentioned in the studies.

Table 2 CI methodology steps.

Methodology	Steps	Citations
Lean Six Sigma	DMAIC, PDCA or PDSA	Daly et al., 2021; Henrique et al., 2021; Teeling, 2023.
Six Sigma	Define, Measure, Analyse, Improve and Control (DMAIC)	Gregory, 2020; Hamid et al., 2020; Karnjanasomwong & Thawesaengskulthai, 2022; Velu et al., 2021.
Lean (Kaizen)	- Manufacturing: Plan, Do, Check and Act (PDCA) - Health & Education: Plan, Do, Study and Act (PDSA)	Hamid, 2020; Henrique et al., 2021; Lopez Delphin, 2021; Pusic et al., 2012; Soares & Navas, 2023.
TQM	- Customer focus - Employee involvement - Integrated system - Process-centric approach - Systematic Flow - Continual efforts	Anvari, 2022

Methodology	Steps	Citations
	• Fact-based decision-making • Relationship Management	
8D	• D1: Team formulation • D2: Problem Description • D3: Interim containment actions • D4: Root Cause Analysis • D5: Corrective Actions • D6: Validate Corrective Actions • D7: Identify & Implement Preventive Actions • D8: Team & Individual Recognition	Elangovan et al., 2021

3.2.2 Innovations Methodologies and Steps

The methodologies used for innovation in each article were analysed. Figure 6 illustrates the frequency of the innovation methodologies. Appendix D, Table 2, indicates the complete article list with the innovation methodologies applied per article.

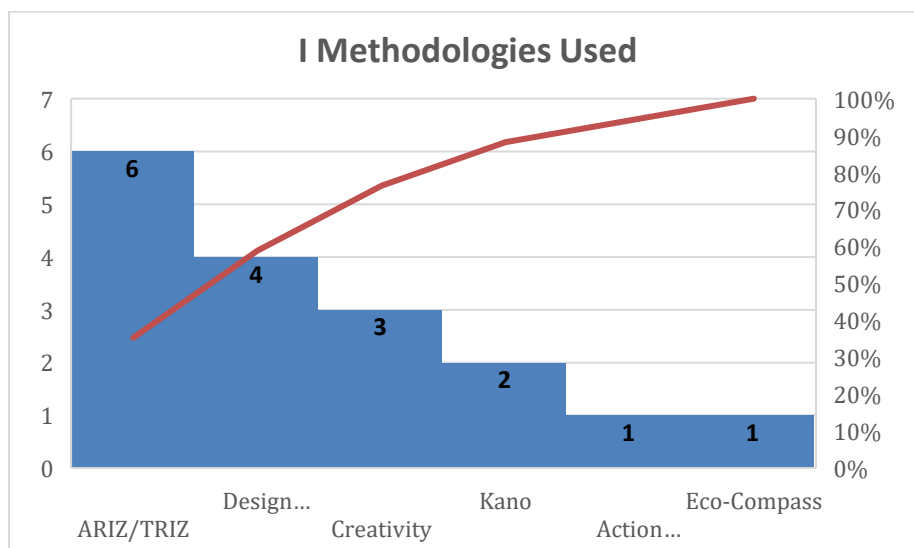


Figure 6. Innovation methodologies

The most frequent methodology used for innovation was TRIZ/ARIZ (an algorithm for inventive problem solving), which was used in 10% of the articles (6 out of 62). These articles define the

TRIZ/ARIZ methodology as a creative problem-solving framework that studies the commonalities of previous solutions. It is about solving problems creatively and then finding existing solutions that can be linked and adapted to the defined situation. It is a systematic approach to increase creativity, rapid problem-solving, and innovation algorithm toolkit (Boadvida et al., 2020; Moussa et al., 2019).

Second, 6% (4 out of 62) of the articles applied the design thinking methodology. Design thinking clearly defines stages of empathise, define, ideate, prototype, and test (Buhl et al., 2019; Lazo-Amado & Andrade-Arenas, 2023). After that, creativity was the third highest and was referred to in 5% of the articles (3 out of 62). Creativity is referred to as part of innovation research, but no steps have been defined, and there is no clear clarity regarding how creativity was applied as an innovation methodology (Buhl et al., 2019; Lui et al., 2020).

The Kano methodology was fourth with 3% of articles (2 out of 62), but it was limited, and no steps have been defined (Anvari, 2022; Hartono et al., 2019; Soares & Navas, 2023).

Eco-Compass was fifth with 2% of the articles (1 out of 62) and was a model developed with TRIZ with clear process steps but limited usage (Boadvida et al., 2020). With 2% of the articles (1 out of 62), Action Research clearly defined steps, but it was complicated to determine if and how the steps were applied (Lewis et al., 2021).

TRIZ/ARIZ and Design Thinking were therefore most frequently used with the most clearly defined process steps.

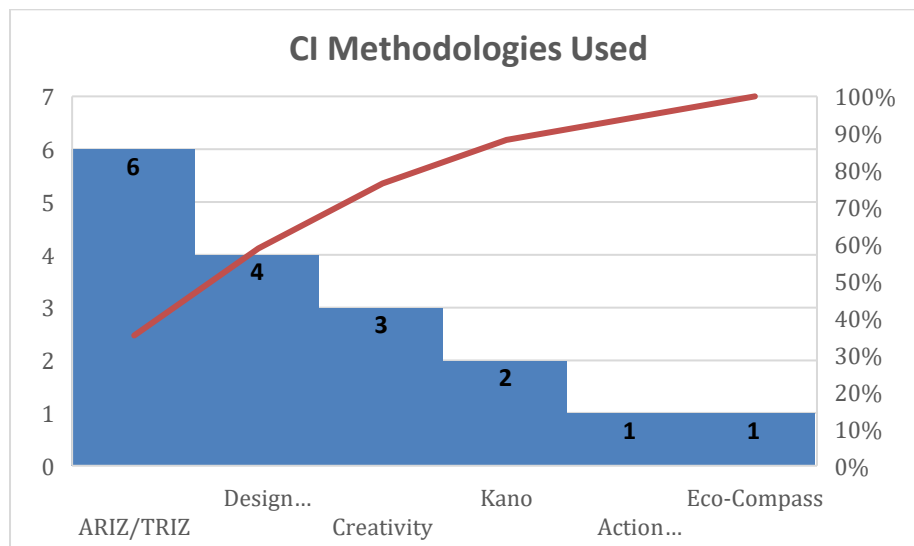


Figure 7. Innovation methodologies.

The steps of the innovation methodologies are identified in Table 3.

Table 3. Innovation methodology steps.

Methodology	Steps	Citations
Ariz/Triz /creative problem solving)	• Define the problem. • Find the TRIZ generalised problem to match the problem. • Find the generalised solution to solve the generalised problem. • Use the identified solution to resolve the problem	Moussa et al., 2019, Boadvida et al., 2020
Design Thinking	• Empathise • Define • Ideate • Prototype and • Test	Buhl et al., 2019, Lazo-Amado and Andrade-Arenas, 2023
Eco-Compass	• System Analysis & Problem Identification • Problem formulation • Generation of a solution • Evaluation of the solution through Eco-Compass • Solution Implementation	Boadvida et al., 2020
Action Research	• Recognise a need for change. • Developing an action plan • Implementing the action plan • Observing and evaluating consequences • Making sense of and sharing lessons learned	Lewis et al., 2021

The following Innovation methodologies did not have clearly defined steps identified in the research papers. The articles only mentioned the following methods:

KANO (Hartono et al., 2019)

Creativity (Buhl et al., 2019)

Although innovative thinking methodologies have steps and tools, these were not identified, nor was the application specified. Refer to Addendum B for the list of innovation tools used.

3.3 Overlap and integration between CI and Innovation.

Although all 62 articles claimed to apply both CI and Innovation methodologies, deeper analysis revealed that proper integration was limited. Most studies emphasised the CI component, particularly Lean, Six Sigma, or TQM, while referring to Innovation Thinking only broadly, with minimal detail on how tools or steps were combined. Only 5% of the articles (3 out of 62) demonstrated a structured integration of CI and Innovation methodologies, often with limitations in scope, clarity, or application.

A clear trend emerged: companies gravitate toward CI methodologies for quick, low-risk wins, often neglecting more complex or uncertain innovation approaches. Innovation Thinking was frequently referenced without detailing specific tools or steps, suggesting a lack of standardisation or familiarity with innovation frameworks. In many cases, CI tools like DMAIC were applied alongside innovation principles without an explicit integration model.

Some studies exemplified hybrid approaches. Karnjanasomwong and Thawesaengskulthai (2022) modified the “Improve” step of DMAIC to include “Innovate,” embedding TRIZ principles directly into the Six Sigma process. Others, like Soares and Navas (2023), combined CI tools from the PDCA cycle with innovation elements to enhance process outcomes in the automotive sector. However, these models were limited to specific industries and often excluded major CI frameworks like Lean or Six Sigma entirely, raising concerns about completeness and generalisability.

Additional integration efforts included blending tools like QFD (a Six Sigma method) with TRIZ for product development (Karnjanasomwong, 2022) or combining TQM with Kano (Anvari, 2022). Some innovation methods were also merged (e.g., TRIZ with Creativity (Liu et al., 2020)), and industry-specific adaptations were observed, such as PDSA in healthcare or 6S for occupational safety (Gregory, 2020; Jiménez et al., 2019).

Despite increasing recognition that CI and Innovation are not inherently contradictory, many researchers still view them as separate or even opposing approaches. Yet, as Lizarelli et al. (2023) noted, mature CI practices often enhance innovation outcomes, and integrating both can

yield greater performance, creativity, and adaptability—when supported by the right culture and strategy.

Overall, only three articles presented structured integration models, and each demonstrates significant limitations that restrict its generalisability. These models are:

1. Dynamic Sigma-TRIZ (Karnjanasomwong & Thawesaengskulthai, 2022) – The article focused on integrated Six Sigma and TRIZ by modifying the “improve” step to “Improve/Innovate”. The article is therefore limited in its application to other CI and Innovation methodologies. The article indicated that it is not sufficient to create the desired innovation solution as it only focused on Six Sigma and its complete omission of Lean principles, which are foundational to CI in many sectors. Another gap identified in the article was an insufficient level of detail in the methodology's steps, and the model only referred to a high level of integration. The article is specifically applicable to the electronic manufacturing industry; therefore, its application to other sectors is not included. The research was also only relevant to Thailand and consequently lacked application to other countries.
2. CI-IMIM (Soares & Navas, 2023) This model integrates the Lean (PDCA cycle) with innovation tools within the automotive sector. The article focused on Lean and Innovation and therefore lacked the integration of other CI and Innovation methodologies. Its key weakness is the exclusion of Six Sigma, which limits its applicability for organisations focused on data-driven variation reduction. The article mentioned Innovation, but no clear outline regarding the methodology was provided. The research is only applicable to Portugal and therefore lacks application to other countries. The article focused specifically on the automotive industry, which has limited applicability to other sectors.
3. DBIR (Fetters et al., 2013) proposed integration principles in chemistry education. As the article is only applicable to the chemistry education, the application to other industries is lacking. A lack of clear methodological steps limits this framework and has not been validated in broader industrial or service contexts, making its practical application outside of its niche unclear. Innovation was only mentioned but not specifically indicated how the methodologies need to be integrated.

These models demonstrate potential but are constrained by their specific industry scope, incomplete inclusion of core CI methodologies, or limited theoretical grounding. This highlights a critical gap: the absence of comprehensive, adaptable frameworks that can guide the integration of CI and Innovation Thinking across diverse sectors and organisational contexts.

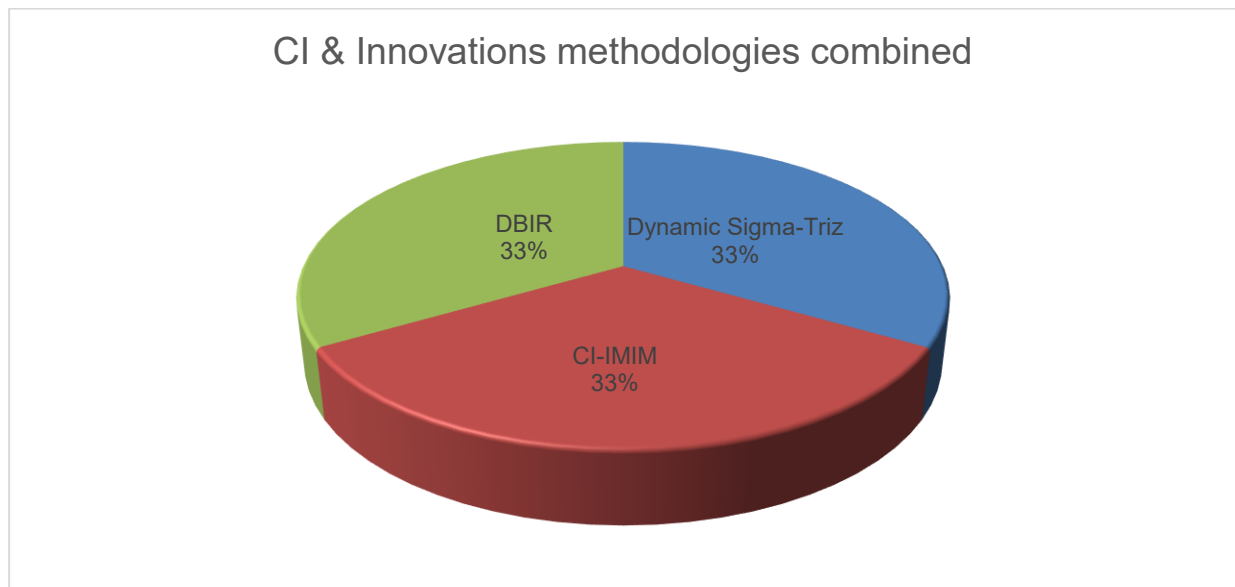


Figure 7 CI & Innovations methodologies combined.

These findings reveal that current integration efforts are mainly reactive, focusing on practical tool combinations rather than structured methodological synthesis. This highlights a maturity gap in how organisations conceptualise the synergy between CI and Innovation Thinking. There is a need for more deliberate frameworks to guide integration at the strategic and operational levels.

3.4 CI and Innovations Methodology steps combined.

The CI, combined with the steps of innovation methodologies, is illustrated in Table 4.

Table 4. Combined CI and innovation steps.

Methodology	Steps	Citations
Dynamic sigma-Triz model	Define, Measure, Analyse, Improve/Innovate and Control	Karnjanasomwong and Thawesaengskulthai, 2022
CI-IMIM	• Problems with numerical prioritisation • Improvement solutions proposal • Improvement solutions triage and prioritisation • Improvement solutions • Action plans • Worker feedback • Results analysis of the taken actions	Soares and Navas, 2023
DBIR (Design-based Implementation Research)	• Deciding on a focus for joint work • Organising a design process • Doing Research • Developing capacity for CI	Underwood and Kararo, 2021

3.4.1 Lessons learnt for implementation of a combined CI and I approach

The lessons learnt for implementing the combined CI and Innovation approach were also identified during the analysis of the articles. As Henrique et al. (2021) stated, top management buy-in and creating a transparent culture are the main success factors for combining both methodologies.

Abdallah (2020) indicates that 70% of CI projects that failed in healthcare were due to a lack of CI knowledge, inadequate training, and a lack of leadership with a clear goal. Henrique et al (2021) further emphasised the importance of training and regular audits for high-level sustainability in healthcare as follows:

“Hospitals need to invest in training, whether in theoretical or on-the-job training. Have regular lean audits and management buy-in.”

Yasar et al. (2019) also state that CI must be expanded across all areas to provide cross-national learning and facilitate innovation. Henrique et al (2021) state that participants felt that the intervention of LSS education and training programs had contributed to what is termed a “culture of quality” in their organisation.

4. Conclusion and Recommendations

4.1 A Conceptual Map for Integration

To address the gap in integrated models, this review proposes a conceptual map to guide future efforts (see Figure 8). This map visually synthesises the review’s findings, positioning organisational culture (emphasising transparency and learning) and top management buy-in as the foundational pillars for success. The map illustrates two primary streams: Continuous Improvement, dominated by methodologies like Lean Six Sigma, TQM, and Lean, and Innovation Thinking, led by frameworks such as TRIZ/ARIZ and Design Thinking. These streams converge through structured integration models (like Dynamic Sigma-TRIZ and CI-IMIM) that blend their respective tools and steps. This visual model serves as a starting point for developing more robust, theoretically grounded frameworks. Figure 8 illustrates the CI and Innovation methodologies that could be demonstrated. The integration of the remaining methods will need to be determined through future research.

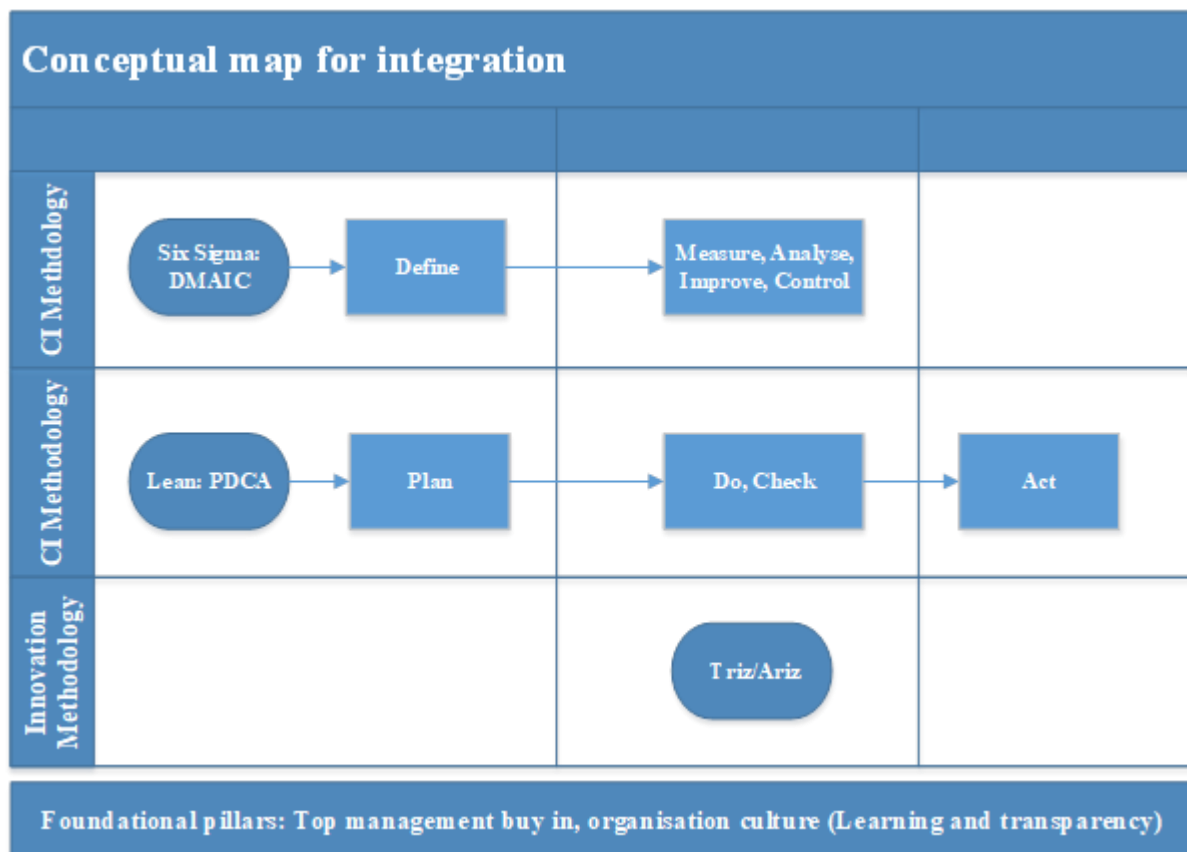


Figure 8 Conceptual map for integration.

4.2 Reflections on Geographic and Industry Biases

The findings reveal significant geographic and industry biases that may skew the current understanding of integration. The dominance of healthcare and manufacturing sectors (68% of articles) suggests that existing literature heavily favours process-centric environments where CI is well-established. The notable absence of the financial industry and other service-based sectors means that current models may not address the unique challenges of intangible value creation and knowledge work. Furthermore, the limited research from regions like Africa points to a Western-centric view of these methodologies, overlooking contextual factors that could influence implementation in developing economies. Future research must consciously address these gaps to develop more universally applicable integration strategies.

4.3 Implications and Directions for Future Research

This scoping review highlights several critical gaps in the literature and points toward clear directions for future research. The following implications should be addressed:

Develop and Test Integrated Frameworks: There is an urgent need to move beyond descriptive studies and develop comprehensive, adaptable frameworks that integrate the primary CI and

Innovation methodologies. Future work should propose and empirically test such models in diverse settings.

Expand Industry and Geographic Scope: Research is needed in underrepresented sectors, particularly service-based industries like finance, to understand how integration can be applied beyond manufacturing and healthcare contexts. Additionally, studies in diverse geographic regions, such as Africa, are required to build a more globally relevant body of knowledge.

Investigate the Role of Organisational Culture: While culture is cited as a key enabler, there is limited research on how to build a culture that simultaneously supports the discipline of CI and the creativity of Innovation. Qualitative case studies could provide deep insights into this dynamic.

Clarify Innovation Methodologies: The application of innovation methodologies often lacks the clarity and detail found in CI descriptions. Future studies should provide more transparent accounts of how tools like Design Thinking or TRIZ are implemented and combined with CI practices.

5. References

- Abdallah, A.A. (2020) "*Healthcare engineering: a Lean management approach.*" Journal of Healthcare Engineering, Vol . 2020, pp 2.
- Abdallah, A.B., Dahiyat, S.E. and Matsui, Y. (2019), "*Lean management and innovation performance.*", Management Research Review, Vol. 42.
- Agyabeng-Mensah, Y., Ahenkorah, E., Afum, E. and Owusu, D. (2020), "*The influence of lean management and environmental practices on relative competitive quality advantage and performance.*", Journal of Manufacturing Technology Management, Vol. 31.
- Alblooshi, M., Shamsuzzaman, M., Karim, A., Haridy, S., Shamsuzzoha, A., Badar, MA., (2022), "*Development of a framework for utilising Lean Six Sigma's intangible impacts in creating organisational innovation climate.*", International Journal of Lean Six Sigma, Vol 14(2), pp. 2-8.
- Allen, L.N. (2023), "Improvement studies for equitable and evidence-based innovation: an overview of the 'IM-SEEN' model." International Journal for Equity in Health, Vol. 22(1).
- Amaral, LCd., Calado, R. D., Teixeira, A. M., MHTd, S., Bourguignon, S. C., Costa, H. G., (2020), "*Systematic review and meta-analysis of the use of lean methods and tools in healthcare services: An alternative to improve care during the pandemic.*".
- Antony, J., Sunder M V., Sreedharan, R., Chakraborty, A. and Gunasekaran, A. (2019), "*A systematic review of Lean in healthcare: a global prospective.*", International Journal of Quality & Reliability Management, Vol. 36(8).
- Anvari, M., & Anvari, A. (2022), "*Innovation realisation with the support of TQM practices: A perspective from Iran's tire industry,*" Proceedings on Engineering Sciences, Vol. 5(1), pp. 1-14, doi: 10.24874/PES05.01.001
- Arksey, H, O'Malley, L. (2005), "Scoping studies: towards a methodological framework," *International Journal of Social Research Methodology*, Vol. 8(1), pp.19-32.
- Belhadi, A., Kamble, S.S., Zkik, K., Cherrafi, A. and Touriki, F.E. (2020), "*A realist inquiry to identify the contribution of Lean Six Sigma to person-centred care and cultures.*", International Journal of Environmental Research and Public Health, Vol. 18(19).
- Boavida, R., Navas, H., Godina, R., Carvalho, H. and Hasegawa, H. (2020), "*Combined use of TRIZ methodology and eco-compass tool as a sustainable innovation model.*", Journal of Applied Sciences, Vol. 10(10).

Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M. and Süßbauer, E. (2019), „*Design thinking for sustainability: Why and how design thinking can foster sustainability-oriented innovation development.*”, Journal of Cleaner Production, Vol. 231.

Creswell, J.W. and Poth, C.N., (2016), *Qualitative inquiry and research design: Choosing among five approaches*, Sage publications, London.

Daly, A., Teeling, S.P., Ward, M., McNamara, M. and Robinson, C. (2021), “*The use of Lean Six Sigma for improving availability of and access to emergency department data to facilitate patient flow.*”, International Journal of Environmental Research and Public Health, Vol. 18(21).

Daudt, H.M., van Mossel, C. and S.J. Scott, S.J. (2013), “Enhancing the scoping study methodology: A large, inter-professional team’s experience with Arksey and O’Malley’s framework”, *BMC Medical Research Methodology*, Vol. 13, pp. 13,48.

Elangovan, S., Jusoh, M.S., Yusuf, D.M., Ismail, M.S. and Din, M.H. (2021), “8D Problem Solving Methodology: Continuous Improvement in Automation Organization.”, Journal of Physics: Conference Series, Vol. 2126.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013), “*Achieving integration in mixed methods designs—principles and practices.*”, *Health services research*, Vol. 48(6pt2), 2134-2156.

Gough, D., Thomas, J. and Oliver, S. (2012), “*Clarifying differences between review designs and methods.*”, *Systematic Reviews*, Vol. 1, pp. 28.

Gregory, C.W. (2020) “*Collaboration versus concreteness: Tensions in designing for scale.*”, Teachers College Record, Vol. 122(12).

Gregory, C.W. (2020), “*Building a quality management system in a core facility: a genomics core case study.*”, Journal of Biomolecular Techniques: JBT, Vol. 31(2).

Gutierrez-Gutierrez, L. and Antony, J. (2020), “*Continuous improvement initiatives for dynamic capabilities development: A systematic literature review.*”, International Journal of Lean Six Sigma, Vol. 11(1).

Hamid, S. (2020), “*Lean Six Sigma: a clinical treatment for the recovery of Indian manufacturing sector from the after-effects of coronavirus.*”, World Journal of Science, Technology and Sustainable Development, Vol. 17(3), pp. 311-322.

Hamid, S., Mureed, S., Kayani, A., Javed, K., Khan, A., Awais, S., Fixsen, D. L., (2020), “*Learning Active implementation frameworks: the role of implementation teams in a case study from Pakistan’.*”, Global Health Action, Vol. 13(1), pp. 1805164.

- Hammami, S., Hmida, F., Gharbi, H., Salah, A.B. and Hamouda, C. (2022), *"Implementation of the 5S-Kaizen-TQM approach in a public hospital in Tunisia."*, La Tunisie Medicale, Vol. 100(7), pp. 503.
- Hartono, M., Setijadi, S. and Norwandi, L. (2019), *"A conceptual integrative model of Kansei Engineering, Kano and TRIZ towards sustainability in services."*, Journal of Advanced Research in Dynamical and Control Systems, Vol. 11(5), pp. 385-390.
- Henrique, D.B. and Godinho, M., (2020). *"A systematic literature review of empirical research in Lean and Six Sigma in healthcare."*, Total Quality Management & Business Excellence, Vol 31(3-4), pp. 429-449.
- Henrique, D.B., Filho, M.G., Marodin, G., Jabbour, A.B.L.D.S. and Chiappetta Jabbour, C.J. (2021), *"A framework to assess sustaining continuous improvement in lean healthcare."*, International Journal of Production Research, Vol. 59(10), pp. 16.
- Ishijima, H. (2022), *"Improvements to healthcare waste management at regional referral hospitals in Tanzania using the KAIZEN approach."*, The TQM Journal, Vol. 34(5), pp. 939-956.
- Jiménez, M., Romero, L., Fernández, J., Espinosa, M.D.M. and Domínguez, M. (2019), *"Extension of the Lean 5S methodology to 6S with an additional layer to ensure occupational safety and health levels."*, Sustainability, Vol. 11(14), pp. 7.
- Karnjanasomwong, J. and Thawesaengskulthai, N. (2022), *"Dynamic sigma-TRIZ solution model for manufacturing improvement and innovation, a case study in Thailand."*, International Journal of Six Sigma and Competitive Advantage, Vol. 11(2-3), pp. 114-156.
- Lazo-Amado, M. and Andrade-Arenas, L. (2023), *"Designing a Mobile Application for Children with Dyslexia in Primary Education Using Augmented Reality."*, International Journal of Interactive Mobile Technologies, Vol. 17(2).
- Lewis, G.K., Williams, B., Allen, S., Goldfarb, B., Lyall, K., Kling, R. and Statham, P. (2021), *"Developing an evaluation tool to provide a 360-degree reflection on work-integrated learning in accounting education."*, Accounting Education, Vol. 30(6), pp. 601-620.
- Liu, Z., Feng, J. and Wang, J. (2020), *"Resource-constrained innovation method for sustainability: application of morphological analysis and TRIZ inventive principles."*, Sustainability, Vol. 12(3), pp. 917.
- Lizarelli, F.L., de Toledo, J.C. and Alliprandini, D.H. (2021), *"Relationship between continuous improvement and innovation performance: an empirical study in Brazilian manufacturing companies."*, Total Quality Management & Business Excellence, Vol. 32(9-10), pp. 981-1004.

- Lizarelli, F.L., Toledo, J.C.D., Gambi, L.D.N. and Gonçalves, C.L. (2023), "*Continuous improvement behaviors and impacts on innovation.*", The TQM Journal, Vol. 35(2), pp. 366-388.
- López de Ipiña¹, J.M., Clavaguera, S., Steck, J., Escabasse, J., Hernan, A., Insunza, M., Gomendiourrutia, P., Machicado, F., & Florez, S. (2021), "*The OASIS-SNF: a new and simplified approach to implement sustainable production in nanomanufacturing pilot lines and evaluate its sustainable manufacturing performance*", Journal of Physics: Conference Series, Vol 1953(2021) 012011, pp 1-8.
- Mendoza-Arviso, U. and Thelma Solís-Rodríguez, F. (2022), "*Quality, knowledge, and innovation of manufacturing processes in Ciudad Juárez, Mexico.*", Retos, Revista de Ciencias Administrativas y Económicas, Vol. 12(23).
- Mohaghegh, M., Blasi, S. and Groessler, A. (2021), "*Dynamic capabilities linking lean practices and sustainable business performance.*", Journal of Cleaner Production, Vol. 322
- Moher, D., Liberati, A., Tetzlaff, J., and Altman, D. G. (2009), "*Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement.* *Journal of Clinical Epidemiology*, Vol. 62(10), pp.1006–1012.
- Moussa, F.Z.B., De Guio, R., Dubois, S., Rasovska, I. and Benmoussa, R. (2019), "*Study of an innovative method based on complementarity between ARIZ, lean management, and discrete event simulation for solving warehousing problems.*", Computers & Industrial Engineering, Vol. 132, pp. 124-140.
- Penker, M., Junermark, P. and Jacobson, S. (2018), "*Sustainable growth and profits,*" San Bernardino, CA: Innovation 360.
- Pusic, M.V., Birnbaum, R.J., Thoma, B., Hamstra, S.J., Cavalcanti, R.B., Warm, E.J., Janssen, A. and Shaw, T. (2023), "*Frameworks for integrating learning analytics with the electronic health record.*" The Journal of Continuing Education in the Health Professions, Vol . 42(1), pp.52-59.
- Soares, V.V. and Navas, H.V.G. (2023) "*New Model for Creating Innovative Solutions in Continuous Improvement Environments.*", International Journal of Systematic Innovation, Vol. 7(5), pp. 10-29.
- Sodhi, H.S. (2020), "*Lean Six Sigma: a clinical treatment for the recovery of Indian manufacturing sector from the after-effects of coronavirus.*", World Journal of Science, Technology and Sustainable Development, Vol. 17(3), pp. 311-322.

- Teece, D.J., Pisano, G. and Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), pp.509-533.
- Teeling, S.P., McGuirk, M., McNamara, M., McGroarty, M. and Igoe, A.(2023), "*The Utilisation of Lean Six Sigma Methodologies in Enhancing Surgical Pathways and Surgical Rehabilitation.*", *Applied Sciences*, Vol. 13(12), pp. 6920.
- Tohidi, H. and Jabbari, M.M. (2012), "*The importance of Innovation and its Crucial Role in Growth, Survival and Success of Organisations.*", *Procedia Technology*, Vol. 1, pp. 535 – 538.
- Underwood, S.M. and Kararo, A.T. (2021), "*Design-Based Implementation Research (DBIR): An Approach to Propagate a Transformed General Chemistry Curriculum across Multiple Institutions.*", *Journal of Chemical Education*, Vol. 98(12), pp. 3643-3655.
- Velu, S.J.S., Jusoh, M.S., Yusuf, D.M., Rosli, A.G.M. and Din, M.H. (2021), "*Six Sigma in Semiconductor: Continuous Improvement in Production Floor Area.*", *Journal of Physics: Conference Series*, Vol. 2129, No. 1, pp. 012036.
- Yasar, N.B., Sezen, B. and Karakadilr, I.S. (2019), "*Mediating effect of continuous improvement on the relationship between innovation and financial performance,*" *Total Quality Management & Business Excellence*, Vol. 30(7-8), pp. 90.
- Yazan, B. (2015). "*Three approaches to case study methods in education: Yin, Merriam, and Stake.*" *The qualitative report*, Vol 20(2), pp.134-152.
- Yin, R. K. (2018), "*Case Study Research and Applications: Design and Methods*" (6th ed.), Thousand Oaks, CA: Sage.

ADDENDUM A: LIST OF CI TOOLS USED

Table 5. List of CI tools used

Lean	Six Sigma	Lean Six Sigma	TQM	TPM	8D
Kaizen	Quality Management	5 Principles of Lean	Customer Focus	Kaizen	Root cause analysis
Kanban	Design of Experiments (DOE)	5S	Just in Time (JIT)	Quality Management	
Layout management	Kaizen	Brainstorming	Process management		
Poka Yoke (Mistake proofing)	Variation deduction	FMEA	Pull vs push		
Process Mapping: Flow chart, SIPOC	Data analytics	Just in Time (JIT)	Quality Management		
Pull vs Push	Regression & Correlation	Kaizen	Relative proximity theory		
Quality Management: QCD: Quality-cost-delivery	Visual Management	Poka Yoke (Mistake proofing)	Workload balancing		
Root cause Analysis: Fishbone/Ishikawa diagram, 5 Whys	Process Mapping: Flow chart, SIPOC	Process Mapping: Flow chart, SIPOC			
Senge's five disciplines	FMEA	Project Charter			
Simulation	Statistical Process Control (SPC)	Quality function deployment (QFD)			
Standardisation	Theory of Constraints/Bottleneck identification	Quality management: CTQ			
Statistical Process Control	Root cause Analysis: Fishbone/Ishikawa diagram, 5 Whys	RACI			
Theory of Constraints/Bottleneck identification	Voice of Customer (VOC)	Root cause Analysis:			

Lean	Six Sigma	Lean Six Sigma	TQM	TPM	8D
		Fishbone/Ishikawa diagram, 5 Whys			
Value adding, non-value adding and wastages (8 types of wastages)	ISO standards	Senge's fifth discipline			
Value stream mapping (VSM)	Standard operating procedure (SOP)	Stakeholder engagements			
Visual management	Visual Management	Standardisation			
Workload balancing/ Takt time.	Brainstorming	Statistical Process Control (SPC)			
	Workload balancing/ Takt time.	Theory of Constraints/Bottleneck identification			
	Batch management: One piece flow	Voice of customer (VOC)			
	Poka Yoke (Mistake proofing)	Value adding, non-value adding and wastages (8 Types of wastages)			
	5S	Value stream mapping			
	Quality function deployment (QFD)	Visual Management			
	Total Quality Management (TQM)	Total Quality Management (TQM)			

ADDENDUM B LIST OF INNOVATIONS TOOLS USED

Table 6. List of Innovations tools used

ARIZ/TRIZ	Design Thinking	Creativity	Kano Model	Action Research	Eco-Compass
Contradictions Matrix (CM)	Problem framing	Brainstorming/mind mapping	Customer Satisfaction Analysis	None mentioned	None mentioned
Brainstorming	User focus and analysis	Six Thinking hat	Product/Service Feature Analysis		
Innovation matrix	Diversity and Visualisation				
Solution standardisation	Prototyping and iteration				
Inventive algorithm	Empathy maps				
Nine window creativity technique	Visualisation				
	Journey mapping				

ADDENDUM C LIST OF FINAL ARTICLES USED AND CI METHODOLOGIES APPLIED

Table 7. List of final articles used and CI methodologies applied

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
1	8D Problem Solving Methodology: Continuous Improvement in Automation Organization.	Elangovan, S., Jusoh, M.S., Yusuf, D.M., Ismail, M.S. and Din, M.H., 2021.		1				1				
2	A discussion of the synergy and divergence between lean six Sigma and person-centred improvement sciences. International	Teeling, S.P., Dewing, J. and Baldie, D., 2020.			1							
3	Extension of the Lean 5S methodology to 6S with an additional layer to ensure occupational safety and health levels.	Jiménez, M., Romero, L., Fernández, J., Espinosa, M.D.M. and Domínguez, M., 2019.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
4	Frameworks for integrating learning analytics with the electronic health record. The Journal of Continuing Education in the Health Professions	Pusic, M.V., Birnbaum, R.J., Thoma, B., Hamstra, S.J., Cavalcanti, R.B., Warm, E.J., Janssen, A. and Shaw, T., 2023.	1								1	
5	Green procurement and green innovation for green organisational legitimacy and access to green finance: The mediating role of total quality management.	Acquah, I.S.K., Baah, C., Agyabeng-Mensah, Y. and Afum, E., 2023.				1						
6	A framework for lean implementation in preoperative assessment: Evidence from a high complexity hospital in Italy.	Goretti, G., Pisarra, M., Capogreco, M.R. and Meroni, P., 2023.			1							
7	Healthcare engineering: a Lean	Abdallah, A.A., 2020.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	management approach.											
8	Implementation of the “5S-Kaizen-TQM” approach into public Hospital in Tunisia.	Hammami, S., Hmida, F., Gharbi, H., Salah, A.B. and Hamouda, C., 2022.			1	1						
9	Improvement studies for equitable and evidence-based innovation: an overview of the ‘IM-SEEN’model.	Allen, L.N., Nkomazana, O., Mishra, S.K., Gichangi, M., Macleod, D., Ramke, J., Bolster, N., Marques, A.P., Rono, H., Burton, M. and Kim, M., 2023.										
10	Improvements to healthcare waste management at regional referral hospitals in Tanzania using the KAIZEN approach.	Ishijima, H., Miyamoto, N., Masaule, F. and John, R., 2022.	1			1						
11	Improving performance of the hospitalisation process by applying the principles of Lean Thinking.	Fiorillo, A., Sorrentino, A., Scala, A., Abbate, V. and Dell'aversana Orabona, G., 2021.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
12	Quality by design (QbD) approach in marketing authorisation procedures of non-biological complex drugs: a critical evaluation.	Zagalo, D.M., Sousa, J. and Simões, S., 2022.		1		1						
13	Quality, knowledge, and innovation of manufacturing processes in Ciudad Juárez, Mexico.	Mendoza-Arviso, U. and Thelma Solís-Rodríguez, F., 2022.		1								
14	Real-time energy flow mapping: A VSM-based proposal for energy efficiency.	Fontoura, L., de Mattos Nascimento, D.L., Neto, J.V., Garcia-Buendia, N., Garza-Reyes, J.A., Lima, G.B.A., Tortorella, G.L., Caiado, R.G.G. and Meiriño, M.J., 2023.	1									
15	Relationship between continuous improvement and innovation performance: an	Lizarelli, F.L., de Toledo, J.C. and Alliprandini, D.H., 2021.			1	1	1					

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	empirical study in Brazilian manufacturing companies.											
16	Research Resiliency through Lean Labs.	Dagdeviren, C., Durak, T. and Sadat, D., 2020.			1							
17	Resource-constrained innovation method for sustainability: application of morphological analysis and TRIZ inventive principles.	Liu, Z., Feng, J. and Wang, J., 2020.										
18	Six Sigma in Semiconductor: Continuous Improvement in Production Floor Area.	Velu, S.J.S., Jusoh, M.S., Yusuf, D.M., Rosli, A.G.M. and Din, M.H., 2021.		1				1				
19	Study of an innovative method based on complementarity between ARIZ, lean management and discrete event	Moussa, F.Z.B., De Guio, R., Dubois, S., Rasovska, I. and Benmoussa, R., 2019.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	simulation for solving warehousing problems.											
20	'That's someone's grandma': Teaching person-centred care in a frailty context.	Robinson, L., Andrew, I., Kenny, L., Garrad, S., Thomson, R. and Fisher, J., 2024.	1									
21	The influence of lean management and environmental practices on relative competitive quality advantage and performance.	Agyabeng-Mensah, Y., Ahenkorah, E., Afum, E. and Owusu, D., 2020.	1			1				1		
22	A combined use of TRIZ methodology and eco-compass tool as a sustainable innovation model.	Boavida, R., Navas, H., Godina, R., Carvalho, H. and Hasegawa, H., 2020.										
23	A conceptual integrative model of Kansei Engineering, Kano and TRIZ towards	Hartono, M., Setijadi, S. and Norwandi, L., 2019.										

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	sustainability in services.											
24	The use of lean six Sigma for improving availability of and access to emergency department data to facilitate patient flow.	Daly, A., Teeling, S.P., Ward, M., McNamara, M. and Robinson, C., 2021.			1							
25	The Utilisation of Lean Six Sigma Methodologies in Enhancing Surgical Pathways and Surgical Rehabilitation.	Teeling, S.P., McGuirk, M., McNamara, M., McGroarty, M. and Igoe, A., 2023.			1							
26	The integrated effect of Big Data Analytics, Lean Six Sigma and Green Manufacturing on the environmental performance of manufacturing companies: The case of North Africa.	Belhadi, A., Kamble, S.S., Zkik, K., Cherrafi, A. and Touriki, F.E., 2020.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
27	Towards a smart lean green production paradigm to improve operational performance.	Fiorello, M., Gladysz, B., Corti, D., Wybraniak-Kujawa, M., Ejsmont, K. and Sorlini, M., 2023.	1									
28	Utilising Lean leadership principles to build an academic primary care practice of the future.	Morduchowicz, S., Lee, J.S., Choi, L., Kivlahan, C., Null, D., Smith, S. and Feldman, M.D., 2020.			1							
29	A framework to assess sustaining continuous improvement in lean healthcare.	Henrique, D.B., Filho, M.G., Marodin, G., Jabbour, A.B.L.D.S. and Chiappetta Jabbour, C.J., 2021.			1							
30	A realist inquiry to identify the contribution of lean six Sigma to person-centred care and cultures.	Teeling, S.P., Dewing, J. and Baldie, D., 2021.			1							
31	A view from within: Lessons learned from partnering for	Harrison, C., Wachen, J., Brown, S. and Cohen-Vogel, L., 2019.	1									

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	continuous improvement.											
32	Application of lean 6s methodology in an engineering education environment during the SARS-CoV-2 pandemic.	Jiménez, M., Romero, L., Fernández, J., Espinosa, M.D.M. and Domínguez, M., 2020.	1									
33	Application of PDCA cycle management for postgraduate medical students during the COVID-19 pandemic.	Gu, S., Zhang, A., Huo, G., Yuan, W., Li, Y., Han, J. and Shen, N., 2021.	1									
34	Application of the theory of constraints to unveil the root causes of the limited market penetration of micro gas turbine systems.	Tilocca, G., Sánchez, D. and Torres-García, M., 2023.			1							
35	Building a quality management system in a core	Gregory, C.W., 2020.		1								

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	facility: a genomics core case study.											
36	Collaboration versus concreteness: Tensions in designing for scale.	Cannata, M. and Nguyen, T.D., 2020.	1									
37	Continual improvement of online and blended teaching using relative proximity theory.	MacLeod, K.R., Swart, W.W. and Paul, R.C., 2019.			1	1						1
38	Continuous improvement behaviors and impacts on innovation.	Lizarelli, F.L., Toledo, J.C.D., Gambi, L.D.N. and Gonçalves, C.L., 2023.			1							
39	Decreasing the environmental impact in an egg-producing farm through the application of LCA and lean tools.	Estrada-Gonzalez, I.E., Taboada-González, P.A., Guerrero-Garcia-Rojas, H. and Marquez-Benavides, L., 2020.	1									
40	Design thinking for sustainability: Why	Buhl, A., Schmidt-Keilich, M., Muster, V.,										

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	and how design thinking can foster sustainability-oriented innovation development.	Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M. and Süßbauer, E., 2019.										
41	Design-Based Implementation Research (DBIR): An Approach to Propagate a Transformed General Chemistry Curriculum across Multiple Institutions.	Underwood, S.M. and Kararo, A.T., 2021.	1									
42	Designing a Mobile Application for Children with Dyslexia in Primary Education Using Augmented Reality.	Lazo-Amado, M. and Andrade-Arenas, L., 2023.	1									
43	Developing a probabilistic decision-making model for reinforced sustainable supplier selection.	Koc, K., Ekmekcioğlu, Ö. and Işık, Z., 2023.	1									
44	Developing a university-	McNamara, M. and Teeling, S.P., 2019.			1						1	

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	accredited Lean Six Sigma curriculum to overcome system blindness.											
45	Developing an evaluation tool to provide a 360-degree reflection on work-integrated learning in accounting education.	Lewis, G.K., Williams, B., Allen, S., Goldfarb, B., Lyall, K., Kling, R. and Statham, P., 2021.			1							
46	Digital lean manufacturing- Collaborative university-industry education in systems design for lean transformation.	Raweewan, M. and Kojima, F., 2020.	1									
47	Dynamic capabilities linking lean practices and sustainable business performance.	Mohaghegh, M., Blasi, S. and Groessler, A., 2021.	1			1	1		1			
48	Effects of innovation, total quality	Texeira-Quiros, J., Justino, M.D.R., Antunes, M.G.,				1						

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	management, and internationalisation on organisational performance of higher education institutions.	Mucharreira, P.R. and Nunes, A.D.T., 2022.										
49	Innovation realisation with the support of TQM practices: A perspective from Iran's tire industry	Anvari, M & Anvari, A., 2022			1	1						
50	Integrating safety, health, and environmental management system: A conceptual framework for achieving lean enterprise outcomes	Kruse, T., Veltri, A, Branscum, A., 2019	1									
51	Introduction to EQIPD quality system	Bespalove et al., 2021			1							
52	Investing in lean manufacturing practices (LMP): an	Bai, C., Satir, A., Sarkis, J., 2019			1		1					

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	environmental and operational perspective											
53	Is lean synergistic with sustainable supply chain? An empirical investigation from emerging economy	Jakhar, S.K., Rathore, H., Mangla, S.K., 2019			1							
54	Lean management and innovation performance	Abdallah, A.B., Dahiyat, S.E., & Matsui, Y., 2019			1	1	1					
55	Lean six Sigma: a clinical treatment for the recovery of Indian manufacturing sector from the after effects of coronavirus	Sodhi, H.S., 2020		1	1							
56	Learning Active implementation frameworks: the role of implementation teams in a case study from Pakistan	Hamid, S., et al., 2020	1									

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
57	Mediating effect of continuous improvement on the relationship between innovation and financial performance	Yasar, N.B., Sezen, B., & Karakadilr, I.S., 2019			1							
58	The OASIS-SNF: a new and simplified approach to implement sustainable production in nanomanufacturing pilot lines and evaluate its sustainable manufacturing performance	Lopez delpina et al., 2021	1									
59	New Model for Creating Innovative Solutions in Continuous Improvement Environments	Soares, V.V. and Navas, H.V.G., 2023	1									
60	Integrating Theory of Constraints, Lean and Six	Gupta, M., Digalwar, A., Gupta, A. and Goyal, A., 2022			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	Sigma: a framework development and its application											
61	Development of a framework for utlising Lean Six Sigma's intangible impacts in creating organisational innovation climate	Alblooshi, M., Shamsuzzaman, M., Karim, A., Haridy, S., Shamsuzzoha, A. and Badar, M.A., 2022			1							
62	Dynamic sigma-TRIZ solution model for manufacturing improvement and innovation, case study in Thailand	Karnjanasomwong, J. and Thawesaengskulthai, N., 2019			1							

CHAPTER 5 PHASE 2: INTERVIEW ROOT CAUSE ANALYSIS

The content of this chapter has been published in the International Journal of Lean Six Sigma. It is important to note that the article is published in American English and was inserted directly from the journal dashboard. The article can also be accessed here: <https://www-emerald-com.nwulib.idm.oclc.org/ijlss/article-pdf/17/8/56/11231003/ijlss-06-2025-0176en.pdf>

Title: Integrating Continuous Improvement and Innovation Thinking in the Banking Sector: A Case Study from South Africa

Type: Empirical Research

Status: Published

5.1 Chapter Orientation

The research report is broken down into 12 Chapters and 4 sections. Figure 5-1 indicates the position of the current chapter within the bigger report structure.

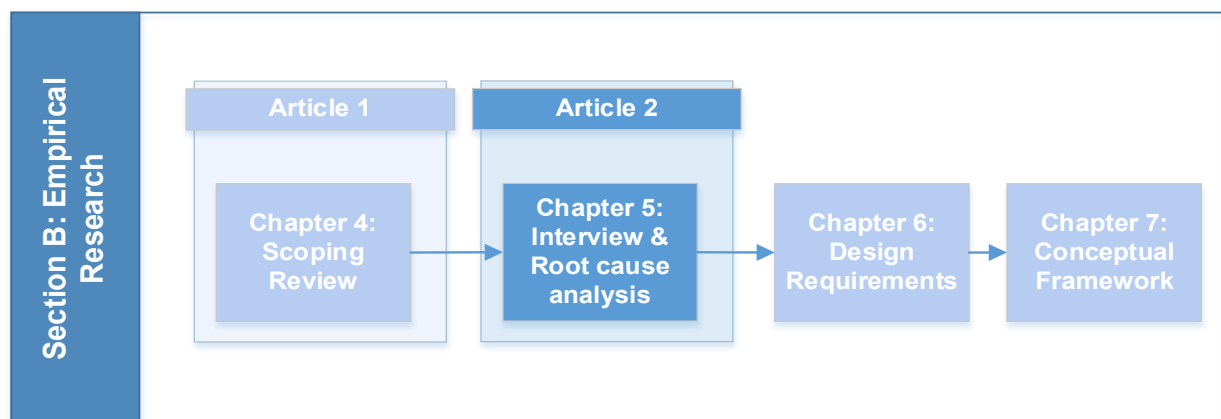


Figure 5-1: Report Structure: Interview & Root cause analysis

This article represents Phase 2 (Root-Cause Analysis) of the broader research project. While Chapter 4 provided a comprehensive overview through a scoping review, this article delivers the empirical foundation of the thesis by diagnosing specific challenges within the South African banking sector and a specific organisation. This article contributes to the project in several ways:

- It identifies five primary root causes for the lack of integration between Continuous Improvement (CI) and Innovation Thinking, including communication silos and institutional culture within the case institution.
- It provides the empirical data necessary to transition from theoretical gaps to practical solutions.
- Findings related to role confusion and performance measurement gaps serve as direct inputs for the Functional, Contextual, and Role requirements developed in Chapter 6.
- It documents the current operational reality that the final CII Integration Model (presented in Chapter 10) is designed to address. The insights gained in this chapter were used to develop an integrated model for CI and Innovation Thinking.

The findings highlighted seven primary barriers to the integration of CI and innovation within the specific case bank: cultural resistance and resistance to change, siloed structures and poor communication, insufficient awareness and training, lack of clear frameworks, limited resource allocation, lack of strategic buy-in, inadequate customer and stakeholder engagement, and the absence of performance measures and feedback loops. Proposed solutions identified by the participants include training initiatives, securing strategic buy-in, centralising CI and innovation functions, and implementing integration strategies.

5.2 Research Question and Objectives

The research questions addressed by this chapter are as follows:

What are the root causes of the specific case study institution's failure to utilise and combine both continuous improvement and Innovation Thinking?

How do continuous improvement projects differ from innovation projects in the banking industry?

How do continuous improvement projects overlap with Innovation Thinking with innovation projects in the banking industry?

How can the methodologies of continuous improvement and innovation be integrated to develop a theoretical comparative framework for the specific case study institution?

The research objectives addressed by this chapter are as follows:

To determine the root causes for not utilising and combining both continuous improvement and innovation methodologies for this specific case study.

To identify elements or necessary components for a theoretical comparative framework to integrate continuous improvement and Innovation Thinking.

Integrating continuous improvement and innovation thinking in the banking sector: a case study from South Africa

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Abstract

Purpose – This study aims to examine the integration of continuous improvement (CI) and innovation thinking in the banking sector, identifying the differences between CI and innovation thinking, the root causes of non-integration and proposing actionable solutions.

Design/methodology/approach – A qualitative case study using semi-structured interviews was conducted at a central South African bank. The data was analyzed through thematic analysis.

Findings – This study identifies seven primary barriers to CI and innovation integration: cultural resistance and resistance to change; siloed structures and poor communication; insufficient awareness and training; lack of clear frameworks; limited resource allocation; lack of strategic buy-in; inadequate customer and stakeholder engagement; and the lack of performance measures and feedback loops. Solutions include training, strategic buy-in, centralized CI and innovation functions and proposed strategies for integration.

Practical implications – This study offers practical strategies for integrating CI and innovation thinking into banking operations, thereby enhancing competitiveness and customer satisfaction.

Originality/value – To the best of the authors' knowledge, this is the first empirical study focusing on integrating CI and innovation thinking in a South African banking context.

Keywords Continuous improvement, Innovation thinking, Lean Six Sigma, Banking sector, South Africa, Design thinking, Creativity

Paper type Research paper

1. Introduction

In today's global economy, organizations face mounting pressure to remain competitive amidst rapid technological change, shifting regulatory environments, and evolving customer expectations. To respond effectively, firms must not only improve operational efficiency but also pursue innovation as a driver of long-term sustainability and growth. Scholars emphasize that the interplay between continuous improvement (CI) and innovation is particularly crucial in achieving both efficiency and adaptability (Jantz, 2016; Ahinful *et al.*, 2024). CI contributes by refining processes, reducing waste, and enhancing service quality,



while innovation introduces transformative ideas that reshape business models and customer experiences.

Against this backdrop, the South African banking sector is undergoing accelerated transformation. Factors such as digitalization, new regulatory requirements, and rising competition have compelled banks to identify innovative ways of creating value for stakeholders and customers (Ahinful *et al.*, 2024). From a national perspective, Wild (2015) emphasizes that innovation is crucial for driving broader economic growth, making the banking industry a strategic focal point for such efforts. Yet, the sector also faces pressing challenges, including customer retention, integrating customer intelligence, and adapting to disruptive business models (Hitachi Solutions, 2022). Research consistently shows that customer satisfaction and retention are pivotal performance metrics (Zhuo, 2019) and that frameworks such as Lean Six Sigma have proven effective in supporting these outcomes. Worley and Doolen (2006) similarly advocate for a stronger focus on customer intelligence in South African financial institutions, given its potential to both enhance satisfaction and reduce operational costs.

Recent scholarships move beyond conceptual debates to emphasize the need for practical strategies that integrate CI and innovation at the methodological level. Richards and Coetzee (2025) argued, for instance, that methodological integration, rather than treating CI and innovation as isolated paradigms, can offer banks actionable pathways to improve performance and resilience. This study builds on such insights by examining how CI and innovation thinking intersect in the South African banking sector, thereby addressing both an empirical gap and a pressing managerial challenge.

1.1 Problem statement

Existing studies have predominantly examined CI approaches, such as Lean and Six Sigma, or innovation frameworks (e.g. design thinking or creativity) in isolation, with minimal attention to their methodological overlap or combined application (Mendoza-Arviso and Thelma Solís-Rodríguez, 2022; Velu *et al.*, 2021).

Moreover, most existing studies are situated in the manufacturing or healthcare sectors of developed economies, leaving a significant research gap in service industries, such as banking in South Africa (Richards and Coetzee, 2025). There has been a lack of research on the root cause of the insufficient integration between CI and innovation thinking, as well as proposed strategies for integration (Richards and Coetzee, 2025). This study addresses this gap by examining how CI and innovation thinking can be integrated into the banking context, using a South African bank as a case study.

1.2 Research aim and objectives

Therefore, in response to this gap, this study aims to address the following objectives:

- Identify CI and innovation thinking methodologies and tools applied in this organization.
- Explore the root causes of the lack of integration and the proposed practical strategies for integrating CI and innovation thinking.

While CI and innovation are well-established contributors to organizational success, their integration remains under-researched, particularly in service industries such as banking. Addressing these research and practical limitations in the banking industry through integrated strategies may enhance competitiveness, resilience and long-term growth.

2. Literature review

Companies must continually improve their competitiveness to succeed and remain in the market in this challenging global economy by applying CI methodologies. Additionally, companies must also pursue radical and incremental innovation to thrive in an increasingly competitive environment. While these two approaches are often treated as distinct, they are inherently complementary to each other. CI emphasizes systematic, small-scale enhancements (incremental innovation), whereas innovation thinking encourages more considerable, riskier changes that require creative disruption (Penker *et al.*, 2018; Tohidi and Jabbari, 2012).

CI provides a structured approach to refining existing processes, enhancing operational efficiency, and minimizing waste (Lizarelli *et al.*, 2023). The most frequent CI methodologies are Lean, Six Sigma, and the combined Lean Six Sigma methodology (Richards and Coetzee, 2025). In this context, methodology refers to the approach and framework used. Each methodology consists of a set of tools. For example, Six Sigma is a methodology that utilizes tools such as failure mode and effects analysis (FMEA), the Fishbone diagram and the Five Whys within its framework.

In contrast, innovation thinking, particularly radical innovation, focuses on transformative ideas that redefine business models, create new products, or dramatically improve customer experiences (Tohidi and Jabbari, 2012). The most frequent innovation thinking methodologies are design thinking, ARIZ/TRIZ and creativity. Examples of innovation tools would be persona development, empathy, and stakeholder mapping (Buhl *et al.*, 2019; Lazo-Amado and Andrade-Arenas, 2023).

However, Penker *et al.* (2018) explained that the biggest failure is that companies are stuck in the CI space (*H1*) and not enough focus is given to the innovative projects space (*H2* and *H3*). Notably, there is less focus on radical innovation, as it is seen as riskier and does not yield rapid, substantial profits in the short term. Only a tiny percentage of these innovative ideas succeed. Therefore, companies tend to focus more on CI, typically incremental innovation thinking, as it is easier and quicker to realize the benefits.

Bridging the gap between CI and innovation requires an understanding of how organizations can effectively balance both approaches. The concept of organizational ambidexterity offers a relevant theoretical framework for achieving this balance. The foundational work of Tushman and O'Reilly (1996) further strengthens this theoretical framing by defining ambidexterity as an organization's ability to exploit established capabilities while exploring novel opportunities simultaneously. In the context of this study, CI reflects exploitation-oriented behaviors focused on refinement and efficiency, whereas innovation thinking aligns with exploration-oriented behaviors aimed at ideation and transformation. Integrating these approaches thus demonstrates a form of contextual ambidexterity, enabling individuals and teams to shift between improvement and innovation as situational demands change.

Structural ambidexterity involves deliberately separating units or teams, with one focusing on CI and the other on innovation. In contrast, contextual ambidexterity enables individuals to switch between these approaches in response to situational demands. Bessant *et al.* (2001) support this dual approach in their evolutionary model of CI behavior, which highlights how leadership, shared learning, and enabling routines embed both incremental and innovative practices. Recent studies further emphasize that aligning innovation with CI relies on shared vision, cross-functional collaboration, and a psychologically safe environment (Martínez-Román *et al.*, 2021; Ibadunni *et al.*, 2022).

In banking, CI has demonstrated tangible benefits in streamlining operations and improving customer satisfaction. For example, [Otieno \(2016\)](#) and [Ahinful et al. \(2024\)](#) describe how Lean Six Sigma has been effectively deployed to reduce waste and increase efficiency. [Zhuo \(2019\)](#) similarly highlights Six Sigma's impact on customer retention, a crucial factor in the success of financial services.

3. Methodology

This study followed a qualitative approach and case study research design to investigate the integration of CI and innovation thinking at a specific bank ([Yin, 2018](#)). The case study methodology is widely used in CI research ([Khan et al., 2019](#)). The study was conducted within a South African bank, which was selected based on its active engagement with CI and innovation initiatives. The bank operates in a highly competitive financial services sector, making it a relevant setting for investigating the barriers and enablers of integrating CI and innovation thinking.

The broader study employed various data generation methods, following a case study research design. Ethical clearance was obtained from the North-West University (NWU-00531–24-A3), and informed consent was obtained from all participants.

Data were collected through semi-structured interviews on MS Teams, which allowed for flexibility while ensuring consistency in addressing the key themes. Thirteen staff members of the case study organization were purposefully selected to participate in this research phase. All participants were innovation champions and had practical exposure to innovation training. They were all at least Green Belt certified in the Lean Six Sigma CI methodology. Before the interviews were conducted, participants were assured of confidentiality and privacy considerations. Each interview lasted between 45 and 60 min.

The participants who volunteered for this study discussed the root causes of the lack of CI and innovation thinking in the banking industry, as well as in their specific institution, and explored the integration, overlap, and differences between CI and innovation thinking.

An independent staff member invited participants who worked in the case study organization and had experience and/or training in CI and innovation thinking methods to participate in this study. The interview guide ([Appendix](#)) is included for transparency.

[Table 1](#) is a breakdown of the demographics for each participant regarding job title, CI and the innovations experience.

The interviews were analyzed using a thematic analysis, following the steps described by [Braun et al. \(2022\)](#). To enhance credibility, dependability, and confirmability, the study employed the following techniques:

- Triangulation: insights were compared across participants to identify consistent themes. Participant insights were triangulated with existing literature.
- Member checking: Allowing participants to review key findings to ensure accuracy.
- Reflexivity: Maintaining a researcher journal documenting biases and reflections throughout the research process.
- Independent co-coding processes: An independent researcher who participated in the data collection process also coded the data separately to limit bias in the findings.

Thematic analysis was selected for its theoretical flexibility and suitability for exploring subjective experiences and complex organizational processes. As outlined by [Braun et al. \(2022\)](#), thematic analysis enables the creation of a rich, detailed and nuanced account of

Table 1. Demographics per participant

Participant	Job title	Job level	CI experience	Innovations experience
1	Solution strategist	Middle management	Lean Six Sigma Green Belt	Innovations champion
2	Business Process Engineer	Middle management	Lean Six Sigma Green Belt, busy with	Innovations champion
3	Office Support Manager	Middle management	Lean Six Sigma Black Belt	Innovations champion
4	Talent Management Specialist	Middle management	Lean Six Sigma Green Belt	Innovations champion, design thinking course
5	Process Engineering Lead	Senior management	Lean Six Sigma Green Belt	Innovations champion
6	Solution Strategist	Middle management	Lean Six Sigma Green Belt	Innovations champion,
7	Business Solutions Manager	Senior management	Lean Six Sigma Green Belt	Innovations champion
8	Sales Operations Manager	Senior management	Lean Six Sigma Green Belt	Innovations champion, GIBS innovations course
9	Credit Head	Senior management	Lean Six Sigma Green Belt	Innovations champion
10	Business Architect	Middle management	Lean Six Sigma Green Belt	Innovations champion, innovations course
11	Business Architect	Middle management	Lean Six Sigma Green Belt, busy with	through MBA
			Black Belt	Innovations champion
12	Process Engineering Lead	Senior management	Lean Six Sigma Green Belt, busy with	Innovations champion
			Lean Six Sigma Black Belt	
13	Process Analyst	Middle management	Lean Six Sigma Green Belt	Innovations champion

qualitative data without being tied to a specific theoretical framework. This made it particularly relevant for the current study, which aimed to understand how CI and innovation thinking can be integrated in a specific institutional context. The method allowed for inductive exploration while maintaining a structured and rigorous analytical process (Terry *et al.*, 2017). It facilitated deep engagement with participants' perspectives, enabling the researcher to identify patterns of meaning while acknowledging the interpretive nature of qualitative inquiry. Moreover, thematic analysis supported a reflective approach that was essential for capturing the tensions, overlaps, and perceived synergies between CI and innovation practices within the organization.

Data saturation was considered reached when no new themes or insights emerged during the coding and analysis process, indicating that sufficient depth and breadth of participant perspectives had been captured (Guest *et al.*, 2006).

4. Findings

The findings were divided into methodologies and tools for CI and innovation thinking, as well as the root causes of the lack of integration and proposed practical strategies for integrating CI and innovation thinking.

Most participants explicitly indicated that CI and innovation thinking are necessary for the company's competitive advantage and must be implemented. Participants agreed that CI and innovation aim to enhance efficiency, customer satisfaction, and competitive advantage. CI focuses on optimizing existing processes, while innovation seeks to create new solutions or significantly improve existing ones. When integrated, they can drive substantial organizational growth.

Figure 1 summarizes the theme logic of the themes presented in this paper.

First, the methodologies and tools identified are discussed, and second, the root causes for the lack of integration of these methods and tools are presented.

4.1 Theme 1: continuous improvement and innovation thinking methodologies and tools

The participants were asked to indicate which CI and innovation methodologies they were familiar with in their workspace. Figure 2 indicates the CI and innovation methodologies identified and the percentage of participants who mentioned the different methodologies:

The CI methodology used most often was the combined Lean Six Sigma methodology, followed by the use of Lean and Six Sigma methodologies separately. Twenty-three percent of participants were unable to identify a methodology, but most could recall the tools used.

Furthermore, creativity was the most frequently applied innovation methodology in projects, followed by design thinking. Participants indicated that they encourage creative and out-of-the-box thinking when involved in innovative projects. However, 62% of participants could not mention any specific innovation methodology. This could be because the participants are unfamiliar with innovation methodologies.

The participants were asked to indicate which CI and innovation tools are most used in their workspace. They mentioned the tools they had used most and that were most applicable to the specific projects they were involved in. Because the banking industry has projects in each department, participants could identify the methodologies and tools they were introduced to in their past projects. This is not surprising, as not all projects require the tools of a specific method to be applied simultaneously. This indicates a lack of correct terminology used in the bank. For example, employees would follow the Lean Six Sigma methodology but also refer to other banking-specific terminology, such as process optimization.

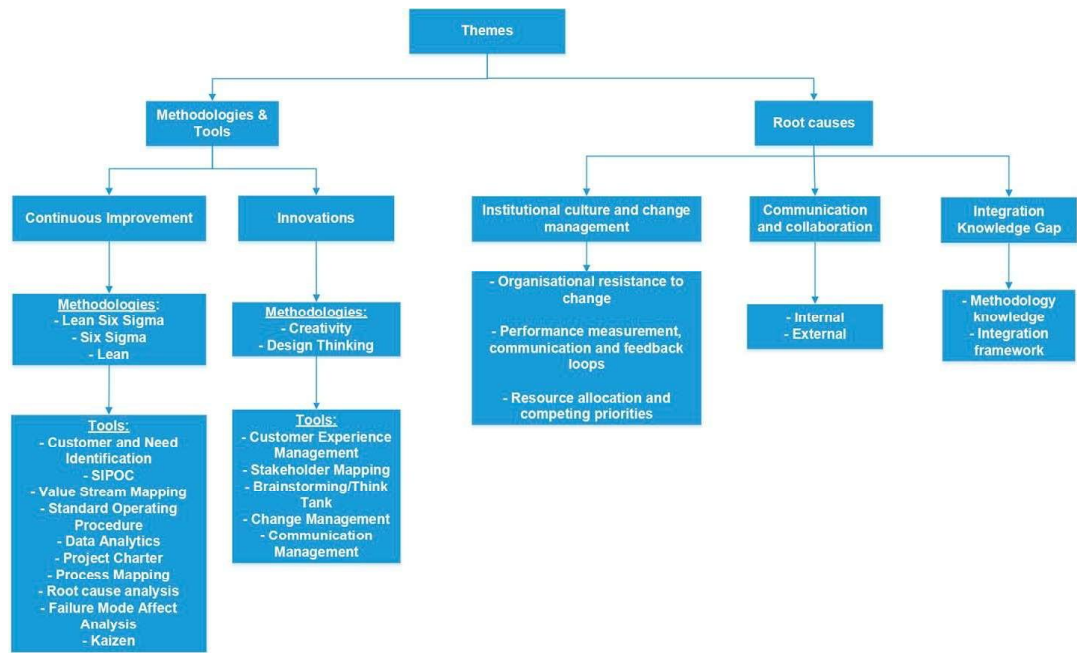


Figure 1. Overview of themes
Source: Authors' own work

Continuous Improvement and Innovations Methodologies		
Continuous Improvement Methodologies		Innovation Methodology
Number of participants	Lean Six Sigma	Creativity
	8 out of 13	4 out of 13
	Lean	Design Thinking
	3 out of 13	2 out of 13
	Six Sigma	None Mentioned
	1 out of 13	8 out of 13
	None mentioned	
	3 out of 13	

Figure 2. CI and innovations methodologies

Source: Authors' own work

Although all participants are innovation champions and have practical exposure to innovation thinking, they have not necessarily received formal theoretical training on innovation methodologies and tools. There remains considerable uncertainty and a lack of knowledge regarding the preferred innovation methodologies and tools (Richards and Coetzee, 2025). This highlights a gap in awareness of innovation methodologies and tools.

6

Figure 3 is a breakdown of the CI tools mentioned by each participant.

The tools used for Six Sigma and Lean are seldom used separately; they are usually combined, depending on the specific project. Therefore, developing the combined Lean Six Sigma methodology was also necessary. Initially, the main tools used for the Six Sigma methodology were Customer and need identification, Project charter, SIPOC, Process mapping, Root cause analysis, Standard operating procedure, FMEA and Data analytics. The primary Lean tools employed were Customer and need identification through value mapping, value stream mapping, Brown paper and Kaizen.

3

Participant 2 explained some of the tools used for CI thinking, explicitly referring to the DMAIC (Six Sigma) methodology:

I have seen them make use of the failure mode and effect analysis [FMEA], which also forms part of the Lean Six Sigma DMAIC methodology. It has been beneficial in identifying any failure points in the process. Additionally, in terms of root cause analysis, I found that we often need to revisit and identify the root causes of why we are building this project to support the fraud team through FMEA. The project originated from a customer experience perspective.

Additionally, Participant 9 explained some of the CI tools used in their area:

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CI tools per participant		
Participants #	Customer and Need Identification	Project charter
	Participant: 1, 2, 5, 11	Participant: 3, 5, 12
	SIPOC	Process Mapping
	Participant: 4, 12, 13	Participant: 3, 7, 11, 13
	Value stream mapping	Root cause analysis
	Participant: 9	Participant: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13
	Standard Operating Procedure	Failure mode affect analysis
	Participant: 1	Participant: 2, 6, 12
	Data analytics	Kaizen
	Participant: 6, 11, 12	Participant: 3, 10

Figure 3. CI tools per participant**Source:** Authors' own work

From a CI perspective, we primarily focus on bottleneck thinking. We apply a lot of the Theory of Constraints to identify the biggest bottleneck.

Figure 4 is a breakdown of the innovation tools referred to by each participant.

The participants were able to recall several CI tools but struggled to remember the innovation tools they use. This highlights a significant gap in their knowledge regarding these tools and suggests a need for further education on innovation tools specifically. Additionally, several participants expressed unfamiliarity with innovations, leading them to rely on CI tools for support. This underscores the importance of CI tools in their work. Some even suggested that innovations are more of a mindset or a structured approach, rather than tools that can be used. Many participants indicated that they were unfamiliar with innovations and used CI tools to assist them. Some participants mentioned that innovations are a way of thinking or a structured approach, and tools are not used.

To address the decision-making process surrounding methodologies and tools implemented, 7 out of 13 (54%) participants discussed the differences between the timeframe and project size for CI and innovation projects. CI projects are seen as quicker because they focus on improving an existing process. CI was mentioned as more incremental innovation projects; therefore, the quick wins. The strategy of driving simplicity, which drives CI projects, was also mentioned as a strategic drive in the workplace. Participant 6 explains how simplicity has served them in the past:

4

6

Innovations tools per participant	
Participants #	
	Customer Experience Management: personas, empathy mapping and needs analysis
	Participant: 2, 4, 7, 13
	Stakeholder mapping
	Participant: 5
	Brainstorming/Think tank
	Participant: 5, 13
	Change management
	Participant: 3
	Communication management
	Participant: 5

Figure 4. Innovation tools per participant
Source: Authors' own work

There has been a fundamental shift in incremental innovations now in the simplicity approach that's been traded into innovations to say that it is not necessarily something that's a game changer in the industry or in the organization that is seen as an innovation, something as simple as optimizing your PMO [Project Management Office] process or your business analyst process, which is independent of platform, technology, or even external Customer.

Innovation projects were seen as more time-consuming and radical projects that require out-of-the-box solutions. Participants indicated that insufficient time is allocated for specific innovation projects; therefore, more dedicated time is needed. Participants mentioned that the company tends to focus more on CI projects due to the short timeframe and the additional dedicated time required for innovation projects.

Participants indicated that they envision processes encouraging more minor innovations in their projects. For example, Participant 2 explains how this specific bank encourages innovation in her department:

In terms of innovations, we have our massive radical innovations. We also encourage employees to enter their mini-innovations into the competition. We encourage all types of innovation, whether it is a breakthrough or small. We are just trying to create that culture of innovation.

Participant 3 supported this notion of mini-ideas by explaining the concept of mini-innovations in their department:

We are trying to encourage significant innovations, but we are also running campaigns for more mini-innovation [Incremental innovations].

Therefore, the project scope and timeframes influence how CI and innovative thinking can be implemented in projects. To this end, participants suggested ways in which CI-trained staff members could become involved in integrated innovation projects. Participant 3 suggested, for example, that staff members with Black and Green Belt Lean Six Sigma training should be linked to larger innovation projects. In contrast, staff members with Yellow Belt Lean Six Sigma training should work on smaller, incremental innovation projects.

The disproportionate familiarity with CI over innovation tools reveals a training and exposure gap that hinders integration. Participants rely heavily on structured CI methods, while innovation thinking remains underdeveloped and informally applied, limiting the organization's capacity for holistic problem-solving.

4.2 Root causes for lack of integration and proposed practical strategies for integrating CI and innovation thinking

Thematic analysis revealed seven key root causes contributing to the limited integration of CI and innovation thinking within the case study bank. These root causes span structural, cultural, and capability-related barriers. Each is presented below with supporting participant insights and proposed strategies for overcoming the challenge. [Figure 5](#) below summarizes the root cause categories.

[Table 2](#) summarizes the root causes and proposed strategies for integrating CI and innovation thinking. A detailed description of each root cause is presented below (see subsections 5.2.1–5.2.3).

4.2.1 Institutional culture and change management. Participants indicated that resistance to change, insufficient post-implementation benefit feedback, and lack of awareness prevent the integration of CI and innovation thinking. They added that the lack of dedicated time and correct resource allocation further contributes to the lack of integration.

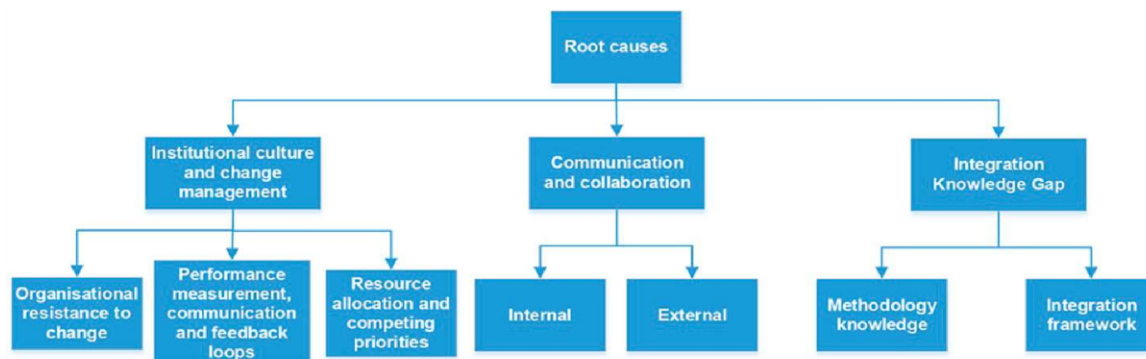


Figure 5. Root cause categories
Source: Authors' own work

Participants stressed three root causes related to institutional culture and change management: organizational resistance to change; performance measurements and feedback loops; and resource allocation. These root causes are discussed in Sections 4.2.1.1–4.2.1.3.

4.2.1.1 Organizational resistance to change. Eight out of 13 participants (62%) indicated that resistance to change and a lack of effective change management prevented the integration of CI and innovations. Participants indicated that the employees would resist new process designs due to a lack of change management. For example, Participant 2 elaborates: “Employees can resist change. I have seen that in some of the branches we currently have, they do not want to use some of the new projects that are coming about”.

Participant 10 captured this sentiment by saying: “If you leave everyone to do their own thing, they will do their own thing”.

To address this resistance, participants suggested that the case study bank should develop a clear culture for integrating CI and innovative thinking methodologies as part of a comprehensive cultural integration strategy. Participant 1 supports the statement: “We must create this culture of continuous improvement and innovation integration. A strong change management strategy needs to be developed”.

To this end, participants believe that buy-in management is required, and they must drive the change while providing clear direction and guidance. A transparent culture is necessary for both methodologies. It was concluded that improved change management is essential to successfully integrate the methods.

4.2.1.2 Lack of performance measurements, communication and feedback. Another aspect of institutional culture and change management that contributes to the lack of integration is the absence of performance measurements, effective communication, and regular feedback. For example, Participant 13 explains, “I feel like the communication of benefits is one of the key things that *they [Management] do not incorporate*”.

The participants suggested that benefits must be tracked and communicated after implementation. Four of the 13 participants (31%) mentioned the importance of precise measurements and benefit calculations for integration. Participants also emphasized the importance of tracking benefits post-implementation, which was necessary for ensuring integration buy-in, support, and business benefits.

Participant 1 suggested ways to measure and evaluate business outcomes: *To measure throughout this process, I must be able to track it post-implementation. That is where the business benefit will be derived.*

Table 2. Summary of root causes and corresponding solutions for CI and innovation integration

Root cause	Subcategory	Description	Proposed solutions
Institutional culture and change management	Organisational resistance to change	Cultural inertia, fear of failure and resistance to new methodologies prevent integration	Promote a transparent CI and innovation integration culture
	Lack of performance measurements, communication and feedback loops	Limited tracking of benefits post-implementation; lessons are not captured. Insufficient benefit communication	- Strengthen change management practices - Communicate benefits clearly - Track benefits post-implementation
	Resource allocation and competing priorities	The lack of dedicated time and correct resource allocation for innovation	- Maintain a lessons learned/project library - Prioritize integration in strategic plans - Allocate dedicated time for innovation due to complexity
Insufficient communication and collaboration	Internal	CI and innovation teams often operate in isolation, resulting in duplicated project efforts and inefficiencies	- Secure executive sponsorship and buy-in - Create centralized cross-functional project teams with regular collaboration forums
	External	Insufficient collaboration with external companies for project solutions and customer engagements	- Enhance visibility of ongoing initiatives through a central project library - Increase customer engagement throughout the project lifecycle - Enhance external collaboration to facilitate the addition of project solutions to the company's project library
Integration knowledge gap	Lack of methodology knowledge	Employees are unfamiliar with innovation methodologies and unclear about how to integrate with CI	- Develop an integrated CI and innovation learning program. This can only be done after the integrated framework has been developed - Provide organisation-wide CI awareness and basic problem-solving training
	Absence of a clear integration framework	No structured framework exists to guide the integrated application of CI and innovation thinking	- Offer targeted innovation training - Develop an integrated CI and innovation methodology framework - Use a phased implementation approach

4.2.1.3 Resource allocation and competing priorities. A recurring theme across participant responses was the issue of limited time and resources, particularly for innovation initiatives. While CI activities are often integrated into daily operations, innovation thinking was perceived as requiring additional effort, dedicated time, and space for creativity, resources that are frequently unavailable in fast-paced banking environments.

Participants consistently highlighted that although innovation is encouraged in principle, the organizational environment prioritizes operational delivery and short-term targets, leaving little room for exploratory work, which was further underlined by [Ngo et al. \(2021\)](#). Participant 6 captured this challenge succinctly:

We always have time for rework, but not necessarily time to stop and fix the actual problems.

This quote underscores how reactive problem-solving is normalized, while proactive innovation is deprioritized due to time constraints. Similarly, Participant 4 observed how competing tasks limit capacity for structured innovation thinking: *The big one is time. I know many people are busy with numerous other things.*

This reflects the broader issue of cognitive and operational overload, where staff are stretched across multiple priorities, making it difficult to engage meaningfully with innovation-related processes that require reflection, ideation, and collaboration.

Moreover, while CI projects are often time-boxed and aligned with quarterly performance expectations, innovation initiatives tend to have longer, more uncertain timelines. Innovation projects are often perceived as risky or unmanageable within regular workloads, particularly when there is no transparent time allocation or buffer capacity. This was echoed by Participant 2: “It becomes a challenge when it takes more time than it should [...] because I’m supposed to be doing other work, but now I have to do this innovation thing”.

Several participants noted that although the bank encourages innovation in principle, this encouragement is rarely aligned with enablers such as protected time, workload adjustments, or innovation initiatives. The resulting tension between delivery and discovery discourages deeper experimentation, particularly for frontline employees.

To overcome this barrier, participants suggested implementing more realistic planning cycles, allocating structured time for innovation (such as innovation hours or project-specific buffers), and securing senior management commitment to balancing short-term delivery with longer-term innovation goals. Allocating dedicated resources for innovation was seen as essential to signal its value and reduce the perception that it is “extra work”.

4.2.2 *Insufficient communication and collaboration.* Participants identified that CI and innovation teams operate in isolation, which causes duplication of project efforts. Additionally, there is a lack of engagement between customers and external companies throughout the project lifecycle regarding project solutions.

Participants stressed two root causes of insufficient communication and collaboration: internal communication and collaboration, and external communication and collaboration.

4.2.2.1 Internal communication and collaboration. Six of the 13 (46%) participants indicated that the lack of communication and collaboration between the CI and innovations teams is a root cause of the insufficient integration of these methodologies.

The teams responsible for driving CI or innovation thinking projects often work in silos, and currently, there are limited opportunities for collaboration.

For example, Participant 4 reflects: “If you are sitting in different meetings and you are like, why aren’t we working together instead of each person in silos working on their own?”.

In line with this, Participant 11 emphasized that different areas are doing valuable work, but there is a need to work together to solve business needs: *I think that what I’m trying to fill*

in are the gaps between the dots that we sometimes miss. No one methodology's going to fix everything.

This lack of communication between departments and teams often leads to duplication of effort. Visibility between different capabilities needs to be improved. Various teams and departments are working on the same projects, but they are unaware of each other due to a lack of visibility.

Participants made concrete suggestions to address these root causes. Some participants suggested a centralized function as a possible solution to integrate CI and innovation thinking to improve collaboration and communication.

Suggestions were made for the centralized function to include CI and innovation representatives who are highly skilled in both methodologies to assist from the beginning throughout the project's lifecycle. This is highlighted in conversation with Participant 2: *The right experts, who are familiar with both methodologies, need to be involved to ensure that an efficient or optimized framework is also put together.*

Participants (Participants 2, 4 and 7) indicated that the CI and innovations teams need regular check-in sessions with specific milestones to assist employees. This team should also assist with networking, which would help with quick project assessments to remove possible project duplication and speed up project implementation.

Participant 10 advocates for a central CI function. They explained how this function has internal and external stakeholder benefits:

A central function will help leaders avoid duplication. One of our responsibilities is to explore ways to do things differently from other departments and externally. We must collaborate with various areas and stakeholders to succeed.

Participant 7 highlights the value of collaboration by stating how they have seen organizational and industry projects and how these stakeholders can learn from each other:

Collaboration has a double benefit, not just to the organization, but also to the people, as we build a network of IP and knowledge [...] I've seen situations where individuals work on a similar topic, which can lead to duplication, and we could collaborate more effectively. It offers a dual benefit, benefiting both individuals and the organization itself.

Participants mentioned developing a library of work-in-progress and completing projects internally to help employees avoid duplicating projects and assist with project solutions. After employees complete their projects, the library must be updated with the finalized work. This process would also promote standardization, a key strategic goal for the company.

4.2.2.2 External communication and collaboration. Ten out of 13 (77%) participants cited insufficient collaboration and engagement with customers and external companies regarding project ideas and solutions. Participant 13 explains, "We already have many solutions from other external companies, but many people are unaware of them, which may result in duplicate efforts".

Nine of the 13 (70%) participants emphasized the importance of examining internal business units or external companies for potential solutions. This included looking externally for trends beyond the banking sector.

Participant 1 emphasizes the need for more customer engagement during the early stages of the project life cycle and throughout project implementation:

We need more customer engagement for innovation projects, from start to end.

Additionally, participants emphasized the importance of gathering customer feedback after project implementation.

4.2.3 *Integration knowledge gap.* Participants indicated that they are not familiar enough with the different methodologies to integrate CI and innovation thinking. They also showed that no clear framework exists to guide the integration.

Participants stressed two root causes related to the integration of the knowledge gap: lack of methodology knowledge, and lack of an integration framework.

4.2.3.1 *Lack of methodology knowledge.* Ten out of 13 (77%) participants indicated that insufficient knowledge of both methodologies prevented integration for CI and innovations.

Most participants were familiar with CI methodologies and tools but had limited knowledge about innovation methodologies and tools. When the participants were familiar with both methods and tools, they still struggled to indicate how they could be integrated.

Participant 4 explained the importance of training for both methodologies: *People have ideas, but they do not know where to start. This might be solved by implementing training that combines these methodologies for employees.*

Speaking on how the training and awareness will make it easier for employees to buy in, Participant 2 states:

It's essential to ensure that all relevant stakeholders are involved, especially those who will be impacted by integrating these methodologies. I think they need to be educated and informed about how it will affect them, and they should have input in combining these two methodologies.

The participants indicated that employees need to increase their knowledge regarding both methodologies.

Ten of the 13 (77%) participants indicated that all employees need training in both methodologies. Four of the 13 participants (30%) suggested that CI training should be compulsory and included in the company's onboarding program. Three of the 13 participants (23%) indicated that CI training should be for all. Still, innovation is a specialized skill that only needs to be applied to select employees with an innovative mindset.

Participant 3 suggested that everyone needs to receive CI training:

I honestly believe that everyone in the bank should attend the white belt, the first level of CI training, at least once. No matter where they are sitting, where they are from, or which area designation they have. That should be standard.

Participant 12 indicated that there are specialized roles, referring to innovations, but they require a collaborative approach:

I believe in the collaborative approach. The issue is that things are increasingly complicated nowadays. That is why we have specialized roles. I see value in reaching a point where we have these guiding principles.

Those guiding principles need to be enforced through training. I think the main thing is that we need to be better at assigning roles to people who are custodians of knowledge or understanding, and where they can take it.

4.2.3.2 *Lack of a formalized integration framework.* Seven of the 13 (54%) participants indicated that a clear integrated methodology framework prevented integration between CI and innovation thinking in the workplace.

For example, Participants 1 and 12 both believe this integrated framework is needed. As Participant 1 explains, "I think what happens is some people do not have a framework, or there is no framework created to facilitate that".

Additionally, most participants suggested that CI should be the foundation for innovations and should be built upon it. Participant 7 explained the importance of first using the CI methodology and thereafter adding more radical technology to the solution:

Let's utilize that technology as an innovative approach in addition to the improvement aspect. So, we did not let the technology drive it. First, let us optimize the process because Lean Six Sigma has been around well before any other innovations, such as Artificial Intelligence.

Participant 5 supports this approach to integration and highlighted the importance of first focusing on the smaller CI methodologies and, thereafter, more innovative solutions:

We need to make first minor, more lean improvements to our processes than larger ones, and radical changes to our processes. The Lean principles are very well-suited to the white and yellow belt trainings that are happening in the organization.

Additionally, Participant 8 reiterated that CI is the foundation of innovations. They stated that "the key, I think, is if you are going to truly innovate, you need the right mindset to start with, and then you provide that mindset with the tools, the thinking, right? So, your continuous improvement provides the thinking and the tools, and then the innovation almost comes out of that".

The participants were more familiar with CI methodologies and tools but less familiar with innovation methodologies and tools, which was a significant factor in their struggle to integrate the methodologies. Innovations, methodologies and tools are often poorly defined and communicated to employees, particularly in the workplace and research settings. Therefore, it is not due to the lack of employees' skill level and exposure but rather the lack of awareness of innovation methodologies and tools in industries and research. Suggestions were made to use empathy from the design thinking methodology, which is part of innovation, and integrate it into the Lean Six Sigma methodology. Through empathy mapping and personas, design thinking was found to be stronger in its customer focus. There were also suggestions to add more of the creativity methodology of innovations to Lean Six Sigma, which is part of the CI thinking. Participants indicated that incremental innovations were very similar to CI, which was an overlap in thinking.

Participant 9 indicated how they try to integrate CI with innovation thinking in their department, also starting with CI and then innovation:

From a continuous improvement perspective, we primarily focus on bottleneck thinking. We apply the Theory of Constraints, identify the biggest bottleneck, and then apply innovations. In terms of innovative thinking, we apply incremental improvement rather than big-bang change. A big-bang change requires a lot of change management compared to incremental improvement.

Nine of the 13 (69%) participants indicated that more customer experience and management throughout the project lifecycle is needed to improve customer centricity.

Participants 1, 4 and 10 highlight this customer-centricity, which is best illustrated by Participant 10, who explains: But I think through people leadership and putting people in the right roles who can join the dots between CX and then take that CX and link it to the capability work that we do from a business architecture perspective and then also rope in, *I guess process ongoing management and improvement*.

Focusing on the customer will allow departments to integrate more innovative thinking in their CI projects. Participant 4 specifically suggested integrating CX with design thinking and Lean Six Sigma as a possible model to ensure the integration of CI and innovation thinking. Participant 4 explains:

You need to understand more of what you are solving for so you can put yourself in the Customer's shoes. During empathy mapping, you first need to understand who you are solving for and the Customer's struggles and needs before you get to the answer.

A clear, integrated methodology framework will help participants integrate CI and innovation thinking into their daily activities.

5. Discussion

The disconnect in methodological knowledge between CI and innovation practices highlights a significant training deficiency and an underlying organizational issue: the lack of a cohesive language and strategic framework for integrating these practices. While Lean Six Sigma is firmly established within operational processes, innovation frameworks are frequently underleveraged or misinterpreted, indicating that innovation has not yet achieved the same level of institutional embedding. This disparity aligns with [Penker et al.'s \(2018\)](#) assertion that organizations often become entrenched in Horizon 1 activities, prioritizing incremental enhancements over transformative change. [Mottaghi et al. \(2022\)](#) also noted that companies tend to focus on improving existing opportunities and then fail to adapt to fundamental innovations in their environment. Companies fail to operate in a balanced manner. This was further highlighted by [Ngo et al. \(2021\)](#), who observed that innovation requires a combination of other assets, including process innovation, which is typically the CI thinking, to succeed in banking ultimately.

The varied perceptions of who should be trained in innovation (everyone versus select individuals) further highlight the cultural ambiguity surrounding innovation ownership within this institution. This ambiguity, which can be seen as a lack of clarity or consensus on who is responsible for driving and implementing innovation, can lead to inefficiencies and missed opportunities. Similar tensions have been observed in previous studies where innovation is siloed in specialist teams, limiting its integration into core operations ([de Amaral et al., 2020](#); [Beyhan Yasar et al., 2019](#)).

Several participants advanced the argument that CI should serve as the methodological foundation for innovation. This CI methodological foundation resonates with hybrid process design models in the literature, where operational excellence and creativity are sequenced rather than merged prematurely ([Antony et al., 2019](#)).

However, it is essential to note that integration is not solely a training function. Strategic leadership must model and reinforce the value of both approaches, as well as cultural alignment across departments, and establish structural mechanisms that encourage cross-functional collaboration. Without these enablers, even the best-trained teams may revert to siloed implementation. This study underscores the crucial role of strategic leadership in the integration process, supporting [Henrique and Godinho's \(2020\)](#) assertion that integration is as much a governance challenge as a methodological one.

Further, this study makes a unique contribution by providing insight into the fact that integration readiness in service sectors, such as banking, is contingent upon balancing formal capability-building (e.g. tiered training) with informal cultural shifts (e.g. reframing innovation as everyone's responsibility). These findings suggest that integration is not a one-time intervention but an ongoing change process that requires continuous commitment to aligning strategy, skills and structure.

The findings of this study underscore the urgent need for integrated frameworks that can guide the practical alignment of CI and innovation thinking in service-based organizations. Unlike manufacturing settings, where process improvement tools and quality standards are often embedded in operational systems, service industries face greater variability, more complex human interactions, and less tangible outputs. These conditions demand flexible but structured approaches to improvement and innovation. However, existing models primarily originate from product-centric or industrial contexts and often fail to accommodate the iterative, relational, and co-creative nature of service delivery ([Antony et al., 2019](#); [Velu et al., 2021](#)). Participants in this study repeatedly called for clarity around when, how and by whom innovation thinking should be applied to CI efforts. Without an integration model, teams often rely on informal equencing or personal judgment, leading to inconsistency and

missed opportunities for synergy. This finding echoes Jan z (2016), who argued that the absence of formal frameworks leads organizations to treat CI and innovation as competing rather than complementary logics. It also builds on Richards and Coetzee's (2025) call for a structured approach to methodological integration, particularly in complex service environments such as banking. What distinguishes service sector needs is the high degree of customer-facing processes, emotional labor and adaptability required. As such, integration frameworks in these contexts must go beyond toolkits and process charts – they must incorporate cultural, strategic and human-centered dimensions. The current study lays the empirical groundwork for such a framework by identifying the root causes, enablers, and staff-level expectations of integration. Future research could develop and test a maturity-based CI–innovation integration model tailored to the service context, supporting structured and scalable implementation.

Figure 6 summarizes the root causes and proposed solutions.

6. Conclusion

This study examined how CI and innovation thinking can be integrated within a South African banking context, offering empirical insight into how organizations balance efficiency and adaptability.

6.1 Theoretical contributions

The findings demonstrate how CI aligns with exploitation-oriented activities focused on refining existing processes, while innovation thinking supports exploration-oriented activities aimed at generating new customer-centered solutions. This strategic balance reflects organizational ambidexterity, defined as the capability to simultaneously exploit established routines while exploring new opportunities (Tushman and O'Reilly, 1996). In this study, ambidexterity was operationalized through the sequencing and layering of CI and innovation thinking methods in different phases of service design, process optimization, and project execution. The study thereby contributes to the literature by showing how ambidexterity can be enacted in service-based environments where customer experience, regulatory complexity, and people-centered interaction play central roles.

Additionally, the study highlights the importance of developing customer-centered frameworks that integrate CI and innovation thinking. Combining Lean Six Sigma with design thinking elements allows organizations to build solutions that are efficient, feasible, and grounded in real customer needs. This integration reflects the role of empathy and customer intelligence in shaping service improvements and innovation outcomes.

6.2 Managerial practices

The findings have several practical implications for the banking sector. First, establishing CI as a foundational capability across the organization is essential. The study highlights that CI awareness and basic problem-solving training should be integrated into the onboarding process for all employees to ensure a shared understanding of improvement language, logic, and expected behaviors. CI provides the thinking and tools that can form the basis from which innovation thinking can evolve. Second, innovation thinking training should be made available to selected teams and individuals who will drive or support innovation projects. While CI may be broadly diffused across the workforce, innovation thinking benefits from focused depth and should be intentionally positioned with those individuals who have both the interest and capability to facilitate creative problem-solving at scale. Third, the study recommends forming a centralized CI–Innovation support unit to ensure visibility, alignment, and collaboration across team. Such a function can help avoid duplication,

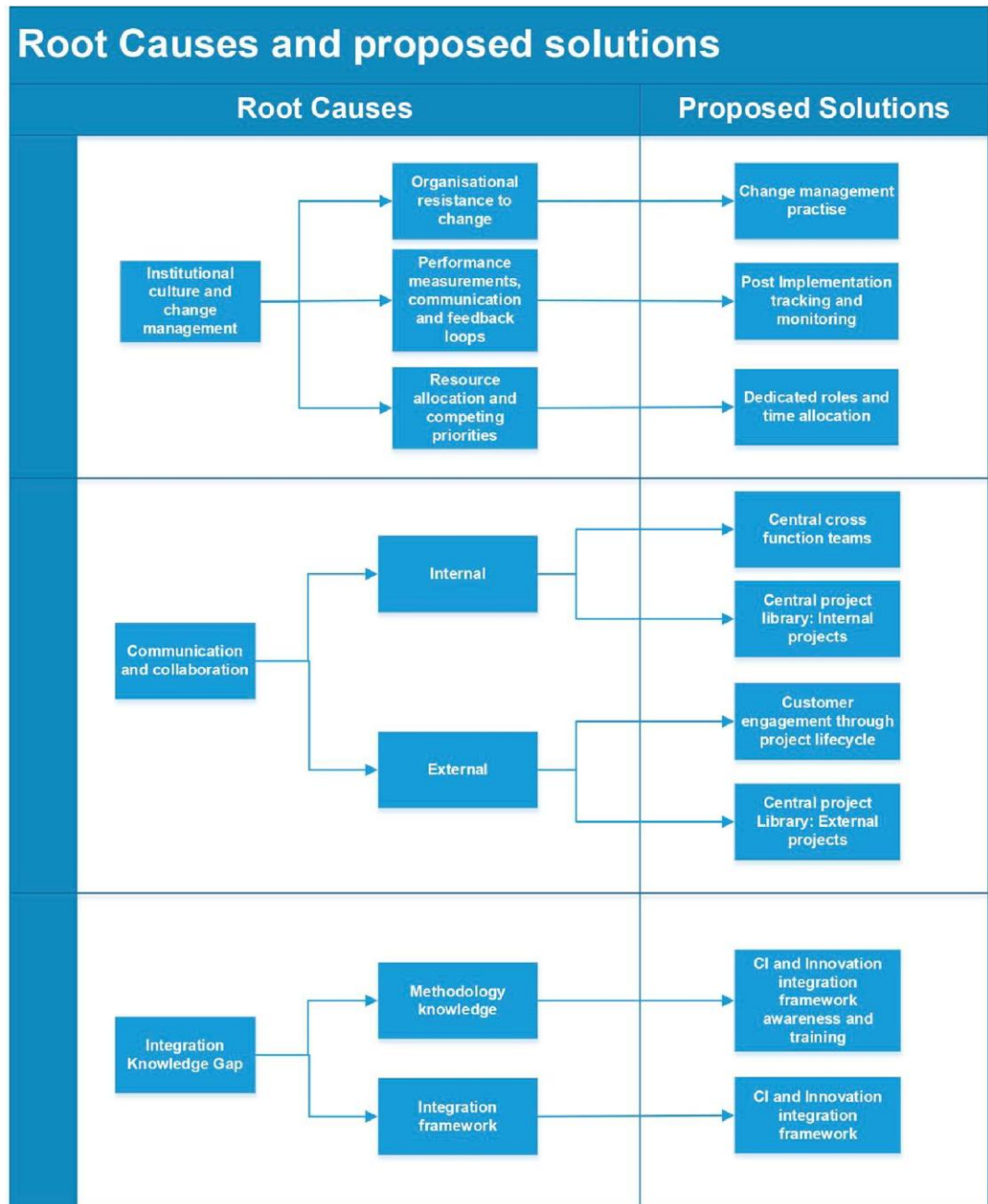


Figure 6. Root causes and proposed solutions
Source: Authors' own work

accelerate solution development and support business units through mentoring, knowledge sharing and strategic coordination. Fourth, the study emphasizes that employees require dedicated time and capacity to engage meaningfully in innovation thinking. Innovation projects are perceived as longer term and exploratory, and without protected time or structured buffers, they risk being overshadowed by short-term operational priorities.

A locating dedicated time signals organizational commitment to innovation, supports cognitive engagement and strengthens the sustainability of outcomes.

Beyond organizational performance, the integration of CI and innovation thinking has broader societal and policy relevance in the South African banking sector. Stronger integration can support financial inclusion by enabling the design of accessible, transparent and user-centered banking solutions. It may also strengthen public trust in financial institutions by improving responsiveness, accountability, and communication. In an environment where digital banking access, institutional credibility, and service quality shape broader economic participation, integrated CI–innovation capability can contribute to enhanced customer well-being and long-term financial system resilience.

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6.3 Limitations and future suggestions

This study was limited to a single South African bank, and its qualitative design does not allow for statistical generalization. While the case-study approach provided in-depth understanding, the findings may vary across organizational contexts, service sectors and geographical regions. Future research should therefore examine CI–innovation integration across additional industries and countries and assess long-term outcomes using longitudinal or mixed-method approaches. A valuable next step is the development and testing of a maturity-based integration model that supports staged capability development and readiness assessment. Once such a model is refined, it should be piloted in additional organizational settings, expanded to related service sectors, and adapted for broader institutional application. This study provides the empirical foundation for such a framework and offers a starting point for advancing both theory and practice on the integration of CI and innovation thinking in complex service environments.

References

- Ahiful, A.A., Opoku Mensah, A., Koomson, S., Nyarko, F.K. and Nkrumah, E. (2024), “A conceptual framework of total quality management on innovation performance in the banking sector”, *The TQM Journal*, Vol. 36 No. 4, pp. 1193-1211.
- Antony, J., Sunder M, V., Sreedharan, R., Chakraborty, A. and Gunasekaran, A. (2019), “A systematic review of lean in healthcare: a global perspective”, *International Journal of Quality and Reliability Management*, Vol. 36 No. 8, pp. 1370-1391.
- Bessant, J., Caffyn, S. and Gallagher, M. (2001), “An evolutionary model of continuous improvement behaviour”, *Technovation*, Vol. 21 No. 2, pp. 67-77, doi: [10.1016/S0166-4972\(00\)00023-7](https://doi.org/10.1016/S0166-4972(00)00023-7).
- Beyhan Yasar, N., Sezen, B. and Karakadilar, I.S. (2019), “Mediating effect of continuous improvement on the relationship between innovation and financial performance”, *Total Quality Management and Business Excellence*, Vol. 30 Nos 7-8, pp. 893-907.
- Braun, V., Clarke, V. and Hayfield, N. (2022), “A starting point for your journey, not a map’: Nikki Hayfield in conversation with Virginia Braun and Victoria Clarke about thematic analysis”, *Qualitative Research in Psychology*, Vol. 19 No. 2, pp. 424-445.
- Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M. and Süßbauer, E. (2019), “Design thinking for sustainability: why and how design thinking can foster sustainability-oriented innovation development”, *Journal of Cleaner Production*, Vol. 231, pp. 1248-1257.
- de Amaral, L.C., Calado, R.D., Teixeira, A.M., Teixeira da Silva, M.H., Bourguignon, S.C. and Gomes Consta, H. (2020), “Systematic review and meta-analysis of the use of lean methods and tools in healthcare services: an alternative to improve care during the pandemic”, *Research Square*, doi: [10.21203/rs.3.rs-53743/v1](https://doi.org/10.21203/rs.3.rs-53743/v1).

- Guest, G., Bunce, A. and Johnson, L. (2006), "How many interviews are enough?: an experiment with data saturation and variability", *Field Methods*, Vol. 18 No. 1, pp. 59-82, doi: [10.1177/1525822X05279903](https://doi.org/10.1177/1525822X05279903).
- Henrique, D.B. and Godinho, F.M. (2020), "A systematic literature review of empirical research in lean and six sigma in healthcare", *Total Quality Management and Business Excellence*, Vol. 31 Nos 3-4, pp. 429-449.
- Hitachi Solutions (2022), "Top 10 banking industry challenges-and how to overcome them", available at: <https://global.hitachi-solutions.com/blog/top-10-challenges-banking-financial-organizations-can-overcome/> (accessed 17 November 2022).
- Ibidunni, A.S., Osabohien, R., Olokundun, M., Amaihian, A., Peter, F. and Oluwole, I. (2022), "Technological capacity and organizational culture as determinants of innovation capability: evidence from the Nigerian banking sector", *International Journal of Business Environment*, Vol. 13 No. 1, pp. 1-19.
- Jantz, R.C. (2016), *Managing Creativity: The Innovative Research Library*, Association of College and Research Libraries, Chicago, IL.
- Khan, S.A., Kaviani, M.A.J., Galli, B. and Ishtiaq, P. (2019), "Application of continuous improvement techniques to improve organisation performance: a case study", *International Journal of Lean Six Sigma*, Vol. 10 No. 2, pp. 542-565.
- Lazo-Amado, M. and Andrade-Arenas, L. (2023), "Designing a mobile application for children with dyslexia in primary education using augmented reality", *International Journal of Interactive Mobile Technologies (IJIM)*, Vol. 17 No. 2, pp. 76-100.
- Lizarelli, F.L., Toledo, J.C.D., Gambi, L.D.N. and Gonçalves, C.L. (2023), "Continuous improvement behaviors and impacts on innovation", *The TQM Journal*, Vol. 35 No. 2, pp. 366-388.
- Martínez-Román, J.A., Gamero, J. and Tamayo, J.A. (2021), "Analysis of innovation in SMEs using an innovative capability-based non-linear model", *Technovation*, Vol. 108 No. 102335, doi: [10.1016/j.technovation.2021.102335](https://doi.org/10.1016/j.technovation.2021.102335).
- Mendoza-Arviso, U. and Thelma Solís-Rodríguez, F. (2022), "Quality, knowledge, and innovation of manufacturing processes in Ciudad Juárez, Mexico", *Retos*, Vol. 12 No. 23, pp. 84-94.
- Mottaghi, M., Daliv, M.R. and Shirvani, A. (2022), "Organizational ambidexterity model for digital innovation in the banking industry", *International Journal of Digital Content Management (IJDCM)*, Vol. 3 No. 4, pp. 153-175.
- Ngo, N.D.K., Le, T.Q., Nguyen-Mau, T. and Huynh, V. (2021), "Evaluating innovation capability in banking under uncertainty", *IEEE Journal*, Vol. 71, pp. 855-872.
- Otieno, A.A. (2016), "Continuous improvement practices and efficiency of commercial banks in Kenya", Doctoral dissertation, University of Nairobi.
- Penker, M., Junermark, P. and Jacobson, S. (2018), *Sustainable Growth and Profits*, Innovation 360, San Bernardino, CA.
- Richards, Y. and Coetzee, R. (2025), "Integrating continuous improvement and innovation thinking: a scoping review", *International Journal of Quality and Reliability Management*, (in review).
- Terry, G., Hayfield, N., Clarke, V. and Braun, V. (2017), "Thematic analysis", in Willig, C. and Rogers, W.S. (Eds), *The Sage Handbook of Qualitative Research in Psychology*, Sage Publications Ltd, pp. 17-36, doi: [10.4135/9781526405555.n2](https://doi.org/10.4135/9781526405555.n2).
- Tohidi, H. and Jabbari, M.M. (2012), "The importance of innovation and its crucial role in growth, survival and success of organisations", *Procedia Technology*, Vol. 1, pp. 535-538. doi: [10.1016/j.protcy.2012.02.116](https://doi.org/10.1016/j.protcy.2012.02.116)
- Tushman, M.L. and O'Reilly, C.A. (1996), "Ambidextrous organizations: managing evolutionary and revolutionary change", *California Management Review*, Vol. 38 No. 4, pp. 8-30, doi: [10.2307/41165852](https://doi.org/10.2307/41165852).

- Ve u, S.J.S., Jusoh, M.S., Yusuf, D.M., Rosli, A.G.M. and Din, M.H. (2021), "S x sigma in semiconductor: continuous improvement in production floor area", *Journal of Physics: Conference Series*, Vol. 2129 No. 1, p. 012036.
- Wild, S. (2015), *Innovation Shaping South Africa through Science*, Gordon Institute of Business Science, Johannesburg.
- Worley, J.M. and Doolen, T.L. (2006), "The role of communication and management support in a lean manufacturing implementation", *Journal of Management Decisions*, Vol. 44 No. 2, pp. 228-245.
- Yin, R.K. (2018), *Case Study Research and Applications*, Sage, Thousand Oaks, CA, Vol. 6.
- Zhuo, Z. (2019), "Research on using six sigma management to improve bank customer satisfaction", *International Journal of Quality Innovation*, Vol. 5 No. 1, p. 3, doi: [10.1186/s40887-019-0028-6](https://doi.org/10.1186/s40887-019-0028-6).

Further reading

- Ahinful, A.A., Opoku Mensah, A., Koomson, S., Cobblah, C., Takyi, G. and Kwarteng, A.H. (2025), "Achieving banking industry innovation performance using total quality management: an empirical study", *The TQM Journal*, Vol. 37 No. 5, pp. 1292-1319.
- Penker, M., Junermark, P. and Jacobson, S. (2017), *How to Assess and Measure Business Innovation Thinking*, Innovation 360, San Bernardino, CA.

Appendix. Interview guide

The development of an integrated continuous improvement and innovation thinking model for a South African bank

Interview structure:

“Good morning/afternoon/evening...”

“Thank you for being prepared to do this interview with me/us today.”

“I am Yolandie Richards, a researcher at the NWU. I am part of a team of researchers who want to understand how to integrate continuous improvement and innovations in the banking industry. From our experience and from what we know, we understand that financial institutions use continuous improvement and Innovation Thinking but seldom integrate the two. However, we know that both are needed to maintain *a competitive advantage*.”

“The purpose of our interview today is to *find out how financial institutions can integrate continuous improvement and innovations thinking in their processes*.”

“I will be conducting several interviews with other Lean Six Sigma green belts to understand your experiences with and suggestions for integrating continuous improvement and innovations thinking in your teams.”

“We will probably take about 90 min to complete our interview.”

“Everything that you say is confidential, and we will not tell anyone your name, surname or any identifiable information.”

“This interview will be audio recorded and transcribed. We record this interview to make sure that we capture everything that you share with us. We will remove your name and identifiable information to protect you. It might be that I will take a few notes during our interview to follow what we talk about.”

“You have given me written permission to do this interview with you and I just need to confirm that this is OK...”

“You can withdraw at any time if you would like to stop or no longer wish to do the interview.”

“If what we talk about makes you feel uncomfortable or you feel you need to talk to someone about it afterwards, I can arrange for you to meet with a counsellor who can assist you.”

“Do you have any questions that you would like to ask me? ...”

You are a *Lean Six Sigma certified greenbelt*, and I would like you to tell me more about your experiences with *continuous improvement and innovations thinking in your team* (Interview follows)

- Tell me about your experience with continuous improvement and innovative thinking in your institution.
- What innovations or continuous improvement methodologies do you apply in your team?
- What innovations or continuous improvement tools do you apply in your team?
- How could continuous improvement and innovative thinking and methodologies be integrated into your team?
- What do you think are the root causes of not integrating continuous improvement and innovative thinking currently?
- What challenges do you envision in integrating innovative thinking and continuous improvement in your team?
- How have you applied your continuous improvement training to improve innovation in your team?

Include interview techniques

Non-verbal: Sit comfortably, face adults openly, maintain good eye contact and lean slightly toward the person.

Verbal techniques: Minimal verbal responses: “Hmm.” “Yes...”

Paraphrasing: repeating a person’s words in your own words

Reflecting: “you feel... because you (content)”; “you thought... because of (content)” Listening

Working silences

Encouraging: “You really tried hard to let me understand your experiences”; “you are really doing well in helping me understand your experiences”

Acknowledging: “thank you for sharing... with me”; “thank you for being prepared to share ... with me”

Clarifying: “you said... what do you mean by that?”; “I’m not clear on what you mean by... could you please explain it to me?”; “I’m not sure I understand what you mean... could you give me an example of ...”

Probing: “you mentioned Could you tell me more about ...”

Summarizing: main points “you told me ... (feelings and content)”

Wind down: give a summary of the major points and take care not to end the interview abruptly.

Conclude the interview/focus group: “Is there anything else important that you would like to add?”

“Are there any questions from your side?”

“If I need to ask you some questions about what we talked about today, would it be OK if I contact you again?”

“You can contact me at [REDACTED]”

“Thank you for sharing your experiences with me today.”

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CHAPTER 6 Phase 3: Design Requirements for Integrated Model

6.1 Chapter Orientation

Figure 6-1 places Chapter 6 in Phase 3: Model Design of the four-phase study structure. Phases 1 and 2 produced the empirical and theoretical insights on which the present requirements are based; Phases 3 and 4 (Chapters 7–8) transform and verify those requirements in the artefact.

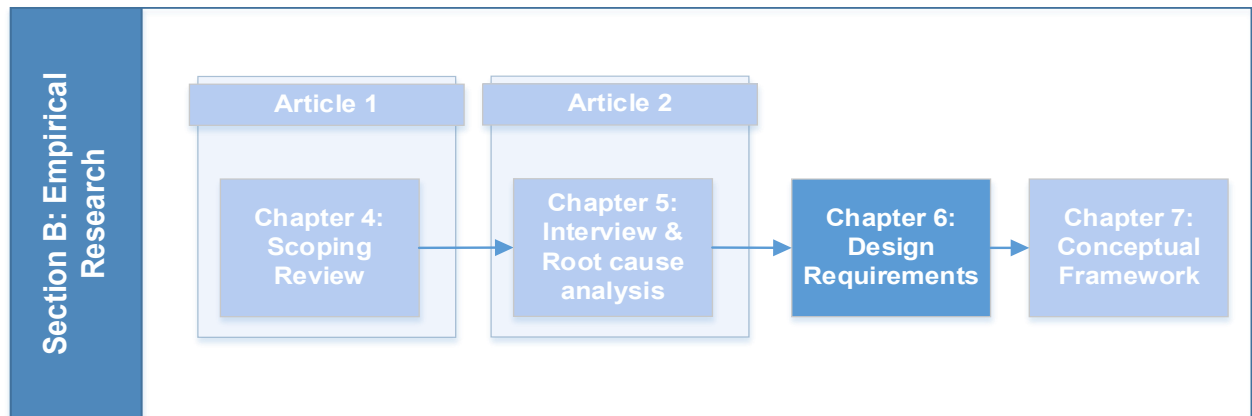


Figure 6-1: Report Structure: Design Requirements

This chapter contributes to the broader research project in several ways:

- It translates the findings from Phases 1 and 2 into 18 testable design requirements.
- It categorises requirements into Functional, Contextual, Process, Role, and Systems groups.
- It maps every requirement to the Dynamic Capabilities logic of sensing, seizing, and transforming.
- It establishes the validation (qualitative evaluation) benchmark used for expert assessment in the Delphi study in Chapter 8.

The insights gained in this chapter were used to ensure the final model fulfils both theoretical intent and practitioner needs.

6.2 Introduction

This chapter presents the design requirements derived from the preceding research phases that the Integrated Model must satisfy. The design requirements translate:

1. Knowledge gaps and success factors identified in the scoping review (Phase 1: Chapter 4).
2. Root-cause analysis themes from the interviews (Phase 2: Chapter 5), and

3. A Design Science reflection on design structures implied by Dynamic Capabilities Theory (Chapter 3) into explicit statements that can guide artefact construction (Phase 3: Chapter 7) and later verification (Phase 4, Chapter 9) and validation (qualitative evaluation) (Phase 4, Chapter 11).

Based on the insights from the scoping review in Phase 1 (Chapter 4) and empirical findings from the root cause analysis in Phase 2 (Chapter 5), this chapter identifies and categorises essential features, mechanisms, and contextual factors the model must include to be both theoretically sound and practically implementable within the South African banking sector. These requirements formed the foundation for developing the Integrated Model for Continuous Improvement and Innovation Thinking in Phase 3 (Chapter 7).

6.3 Method of Deriving Design Requirements

The development of these requirements followed the Design Science Research (DSR) cycle (Hevner et al., 2004):

6.3.1 Extraction.

As part of the extraction process, patterns identified in the scoping review (Phase 1: Chapter 4), the themes identified in the root-cause analysis (Phase 2: Chapter 5) and the three key activities of the Dynamic Capabilities Theory were extracted.

6.3.2 Thematic grouping

The items were grouped according to shared objectives or patterns observed. The initial groupings were functional aspects of the model, contextual factors, methodology, stakeholders, systems requirements, and model infrastructure.

6.3.3 Requirement drafting

The next step was to draft requirements from each thematic grouping. The requirements were stated as a design requirement that could be validated (evaluated) (Phase 4: Chapter 11).

6.3.4 Theory mapping

The draft requirements were reviewed and aligned with the DCT activities (sense, seize, or reconfigure) to ensure they cover the necessary theoretical aspects. Additionally, it was compared with the findings of the Scoping Review (Phase 1: Chapter 4) to ensure it aligns with literature recommendations.

6.3.5 Iterative refinement.

The draft requirements were reviewed and adjusted for clarity and redundancy.

6.3.6 Validation (Evaluation) Readiness.

The resulting list of requirements was identified and applied during model development. Recurring patterns, gaps, and needs identified were grouped, analysed, and translated into a set of requirements that address:

Functional integration of CI and Innovation,

Contextual relevance for the banking sector,

Methodological and Process Requirements,

Role-Player and Support Requirements,

Systems and Infrastructure Requirements.

6.4 Requirement Categories

Based on the requirement categories identified in section 6.3, five plain language requirement categories were adopted. The DCT emphasis column in the table below emphasises which dynamic capability activity the category mainly supports. This table was created to show the theoretical underpinning of each category. The column Empirical contribution indicates which empirical research phase contributed to these requirements.

Table 6-1: Requirement Categories

Category code	Category	Scope of requirements	DCT emphasis	Empirical contribution to requirements
FR	F Functional	What the model must do	Sense and seize	Phases 1 and 2: Chapters 2, 4 and 5
CR	C Contextual	Constraints of SA banking	Sense, seize and reconfigure	Phase 2: Chapter 3, 5
PR	P Process	Methods, phases, tools	Seize and reconfigure	Phases 1 and 2: Chapters 4 and 5
RR	R Roles	Human capability needs	Seize	Phase 2: Chapter 5
SR	S Systems	Digital/physical infrastructure	Reconfigure	Phases 1, 2 and 4: Chapters 2, 4, 5 and 8

6.4.1 Functional Requirements

The functional requirements define the core capabilities the model must fulfil to support integrated improvement efforts:

FR1: Integrate CI and Innovation as complementary processes, not opposing paradigms.

FR2: Include structured, phased steps for project identification, problem-solving, and solution rollout.

FR3: Support iterative refinement and validation of ideas and solutions (DMAIC, PDCA, prototyping).

FR4: Align improvement initiatives with Continuous Improvement operational improvements (Incremental) and long-term strategic innovation (Radical).

These requirements were derived from Phase 2: Chapters 4 and 5. During the root cause analysis, participants indicated what the model must be able to do if applied across different projects within the banking industry.

6.4.2 Contextual Requirements for South African Banking

The contextual requirements align with the three activities of the Dynamic Capabilities Theory, namely: (a) to identify opportunities and challenges in the complex business environment, (b)

identify how to use resources within the organisation to seize opportunities, and (c) ensure relevance for teams to be innovative and stay competitive (Teece, 2018; 2025).

Following the Dynamic Capabilities Theory (Teece, 2018; 2025), the model must reflect organisational realities in the South African financial services sector, including:

CR1: Enable implementation within compliance-heavy, risk-averse environments.

CR2: Fit into hierarchical, siloed organisational structures upfront without requiring a complete cultural transformation.

CR3: Acknowledge time/resource constraints in operational teams and avoid overburdening them with new responsibilities.

CR4: Be relevant for hybrid teams (some mature in CI, others emerging in Innovation).

The contextual requirements identified were developed from Phase 2 of the research process. Participants reflected on the contextual factors that hinder the integration of CI and Innovation and identified the challenges they face when implementing new strategies. They also reflected on possible solutions to overcome these contextual challenges. These requirements were developed from these reflections (Phase 2: Chapter 5).

6.4.3 Process Requirements

These requirements guide how the model should be structured and combine methodologies:

PR1: Use known and trusted CI frameworks like Lean Six Sigma (DMAIC, PDCA).

PR2: Embed Innovation Thinking methodologies (Design Thinking, TRIZ, Creativity) in relevant phases.

PR3: Apply a maturity-based phase approach, allowing organisations to start from simple to complex integration based on their existing infrastructure and internal processes.

PR4: Ensure that CI and Innovation steps are parallel and synergistically linked within each phase.

The process requirements were developed based on the findings of the Scoping Review (Phase 1: Chapter 4) and suggestions from participants in the root-cause analysis interviews (Phase 2: Chapter 5).

6.4.4 Role Requirements

Clear roles and support structures are critical for sustainable integration. Based on the root cause analysis interviews (Phase 2: Chapter 5), the following role requirements were identified:

RR1: Define responsibilities for all employee levels, from awareness (White/Yellow Belt) to specialist (Green/Black Belt).

RR2: Include innovation and process representatives in support roles with bridging responsibilities.

RR3: Define a “research team” function to explore external solutions and reduce internal duplication.

RR4: Support career development and upskilling through embedded learning pathways and cross-role exposure.

These requirements were deemed necessary to align with the internal reporting structure of the banking industry.

6.4.5 Systems Requirements

The model should be supported by an organisational infrastructure that enables reuse, learning, and visibility. The systems’ requirements were derived from Phases 1 and 2 of the research process.

SR1: Include a project and solution library to reduce duplication and improve access to prior learnings.

SR2: Allow for integration with existing performance and reporting systems.

SR3: Use visual tools and templates to support the implementation of improvement work and communication.

The requirements also closely align with the limited literature, which indicates that continuous improvement and innovation methodologies should be integrated (Yasar, 2019; Penker et al., 2018).

6.5 Traceability of Requirements

Table 6-2 below summarises all the requirements linked to the source, model phase, and chapters.

Table 6-2: Traceability of Requirements

Requirement category	Evidence	Chapter derived from	Reference to Conceptual Model (Chapter 7)	Verified / Refined (Delphi, Chapter 8)
FR1–FR4	Literature, Scoping Review, Interviews	2, 4, 5	Figure 7-2: Overall model diagram Sections 7.2.1 - 7.2.4	Round 1 Section 8.5 Round 2 Section 8.6 Table 8.4: Consensus Achieved
CR1–CR4	Theory, Interviews	3, 5	Context notes in Phase 2 & 4 descriptions Sections 7.2.1 - 7.2.4	Round 1 Section 8.5.3 Round 2 Section 8.6 Table 8.4: Consensus Achieved
PR1–PR4	Scoping Review, Interviews	4, 5	Sections 7.2.1 - 7.2.4	Round 1 Section 8.5.2 Round 2 Section 8.6 Table 8.4: Consensus Achieved
RR1–RR4	Interviews	5	Section 7.2.2	Round 1 Section 8.5.5 Round 2 Section 8.6 Table 8.4: Consensus Achieved
SR1–SR3	Literature, Interviews, Scoping Review and Delphi	2, 4, 5, 8	Sections 7.2.3.2 -7.2.3.4	Round 1 Section 8.5.3 Round 2 Section 8.6 Table 8.4: Consensus Achieved

6.6 Conclusion

This chapter used the findings of the scoping review and interview evidence to create concise design requirements for an integrated CI and Innovations model. Eighteen requirements were developed and grouped into Functional, Contextual, Process, Roles, and Systems categories and mapped to the sense–seize–reconfigure logic of the Dynamic Capabilities Theory. These design

requirements form the criteria against which the subsequent model iteration will be validated (evaluated). The traceability grid (Table 6-2) links each requirement to its data source and planned verification step. The conceptual model is presented in Chapter 7.

CHAPTER 7 CONCEPTUAL FRAMEWORK

7.1 Chapter Orientation

The research report is broken down into 12 Chapters and four sections. Figure 7-1 indicates the position of the current chapter within the bigger report structure.

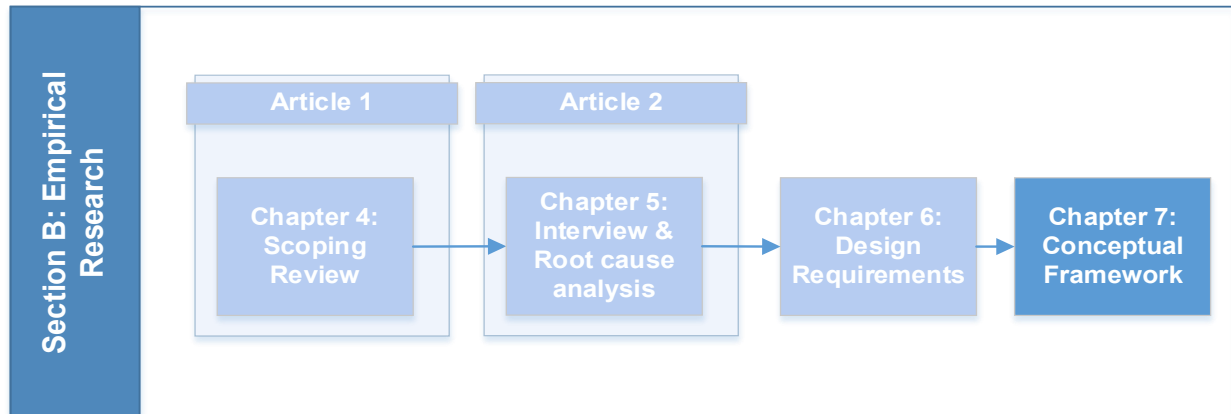


Figure 7-1: Report Structure: Conceptual Framework

This chapter presents the initial Conceptual Framework for Phase 3 (Artefact Design). It contributes to the project in several ways:

It integrates Lean, Six Sigma, and Design Thinking into a single, phased workflow.

It defines the initial architecture for maturity levels and cross-functional roles.

It introduces the Project and Solutions Library as a mechanism to prevent internal duplication.

It provides the first visual representation of the artefact for expert refinement (case organisation participants). The insights gained in this chapter informed the initial design, which was subjected to expert verification in subsequent Delphi rounds.

7.2 Introduction and development of the Conceptual Model

This conceptual model was developed from the themes identified in Phases 1 and 2 (Chapters 4 and 5) of this research process, as well as the Design Requirements identified in Phase 3 (Chapter 6).

The conceptual model was developed in accordance with the design requirements defined during Phase 3, as outlined in Table 6.1 (Chapter 6). Below outlines how the relevant sections complied with the design requirements set out in Table 6-1.

The Functional Requirements (FR1- FR4) were built into the below sections 7.3.1 – 7.3.4.

The Contextual Requirements (CR1-CR4) were built into the below sections 7.3.1 – 7.3.4.

The Process Requirements (PR1-PF4) were built into the below sections 7.3.1 – 7.3.4.

The Role Requirements (RR1-RR4) were built into the below sections 7.3.2.

The System Requirements (SR1-SR3) were built into the below sections 7.3.3.2 – 7.3.3.4.

This conceptual model integrates Continuous Improvement and Innovation Thinking and can be used to apply both methodologies to banking projects, which is required for companies to stay competitive. The company can implement the model by following the approach in Table 6-1. To meet the requirements and needs of participants, the conceptual model was built on various CI and Innovation methodologies, methodology steps, phases, maturity levels, and role players. These aspects are explained below.

7.2.1 CI and Innovations Methodologies and methodology steps

The scoping review (Phase 2, Chapter 4) provided a base understanding of the CI and Innovations methodologies applied across all industries. In contrast, the interviews (Phase 2, Chapter 5) provided more detailed information about the methodologies and tools used in the specific case-study organisation.

The most popular and widely used methodologies for CI and Innovation Thinking were identified through the scoping review in Phase 1 (Chapter 4) and the participants' interviews in Phase 2 (Chapter 5).

The Lean and Six Sigma methodologies, identified during the Scoping Review (Chapter 4), are popular in this case-study organisation and have therefore been included as the methodologies used for CI. Awareness of the methodologies had already been created, and they were successfully implemented in the case-study organisation.

The Lean process steps used the Deming's cycle PDCA (Soares & Navas, 2023) and the Six Sigma process steps (Define, Measure, Analyse, Improve and Control) (Teeling et al., 2023) were used in the model as defined during the Literature review in Chapter 2 and Phase 1 in the Scoping Review (Chapter 4).

Table 7-1 indicates the overlap between the DMAIC of Six Sigma and the PDCA of Lean. (Teeling et al., 2023), (Lizarelli et al., 2023).

Table 7-1: Methodology Step overlap for Lean & Six Sigma

PDCA	DMAIC
Plan	Define
	Measure
	Analyse
Do	Improve
Check	Control
Act	-

Design Thinking and TRIZ/ARIZ/Creative problem solving were used in the Innovations Methodology, as these methodologies were among the most widely used and popular (Chapters 4 and 5). The Design Thinking process steps (Empathise, define, Ideate, Prototype and Test) (Lazo-Amado & Andrade-Arenas, 2023), TRIZ/ARIZ (Moussa et al., 2019; Boavida et al., 2020) and Creativity thinking were used as defined during the Literature review in Chapter 2 and Phase 1 in the Scoping Review (Chapter 4).

Lean, Six Sigma, and Design Thinking have clearly defined phases. After completing the Literature Review (Chapter 2), Scoping Review (Chapter 4) and interviews, the researcher combined the phases for Lean, Six Sigma and Design Thinking as indicated in Table 7-2.

Table 7-2: Methodology step overlap for Lean, Six Sigma and Design Thinking

Methodology	Process Steps					
Six Sigma	Define	Measure	Analyze	Improve	Control	-
Lean	Plan			Do	Check	Act
Design Thinking	Empathise, define & ideate			Prototype	Test	-

The Functional (FR1 – FR4), Contextual (CR1 – CR 4), Process Requirements (PR1-PR4) and System Requirements (SR1-SR3) of the Design Requirements that were defined during Phase 3 (Chapter 6) were built into the model in this section.

7.2.2 Phases

A phased approach was developed to help companies follow a structured process. A phased approach is also used in the Lean, Six Sigma, and Design Thinking methodologies, contributing to the development of an integrated method. The participants were therefore already familiar with and comfortable following a structured, phased approach, which would assist with implementing

the new integrated model. The case study company also follows a phased approach during project implementation, which helps secure buy-in and support for a new integrated model.

Four phases were defined: Identification and definition (Phase 1), Project and solutions library (Phase 2), Solutioning/Improvement (Phase 3) and Standardisation & Sustainability (Phase 4). The following contributed to defining the different phases:

Identification and definition (Phase 1): Similar phases were used for Lean, Six Sigma, and Design Thinking, as shown in Table 7-2.

Project and solutions library (Phase 2): A similar concept applies to the TRIZ/ARIZ methodology and to suggestions from participants identified during the interviews.

Solutioning/Improvement (Phase 3): Similar phases were used for Lean, Six Sigma, and Design Thinking, as shown in Table 7-2.

Standardisation & Sustainability (Phase 4): A similar phase is used for lean, and a similar concept applies to the TRIZ/ARIZ methodology and to suggestions during interviews with participants.

The Functional (FR1 – FR4), Contextual (CR1 – CR 4), Process Requirements (PR1-PR4) and System Requirements (SR1-SR3) of the Design Requirements that were defined during Phase 3 (Chapter 6) were integrated in this section.

7.2.3 Maturity levels

The maturity level of an organisation or business unit varies according to its processes, exposure to Innovation Thinking, and growth. Therefore, a model was developed to accommodate different maturity levels. Maturity levels 1–4 were defined, with level 1 as the lowest and level 4 as the highest. A maturity level in this model is not implemented in isolation; it includes all preceding maturity levels. For example, if a company is at a level 3 Maturity, then it means that the levels 1 and 2, together with level 3 Maturity, will be implemented. Although the model refers to maturity levels, it is not a Maturity model but does indicate different maturity levels for the organisation. Maturity levels are used to indicate the maturity of the team using the model; therefore, the progress levels of the business units.

A company will therefore first determine its maturity level and then follow the corresponding swim lane activities, starting in Phase 1 and working through to Phase 4, with the respective role players defined.

A detailed explanation of each maturity level is set out in Chapter 10, "CII Integration Model".

The Functional (FR1 – FR4), Contextual (CR1 – CR 4), Process Requirements (PR1-PR4) and System Requirements (SR1-SR3) of the Design Requirements that were defined during Phase 3 (Chapter 6) were addressed in this section.

7.2.4 Role players

The conceptual model included the role players involved in its application. Interview participants indicated that there should be at least three broad categories of role players. Various role players will implement different functions.

The different role players are presented in section 7.3.2. Additionally, a detailed explanation of each role player is set out in Chapter 10: CII Integration Model.

The Role Requirements (RR1-RR4) of the Design Requirements that were defined during Phase 3 (Chapter 6) were addressed in this section. The conceptual model document, as outlined below, was shared with participants during the first round of the Delphi process in Phase 4 (Chapter 8). The headings were numbered in line with the current document conventions for ease of reading.

7.3 Continuous Improvement and Innovations Integrated Model

An integrated model has been developed for Continuous Improvement and Innovation Thinking. The model includes methodologies, phases, roles, players, and the organisation's maturity level.

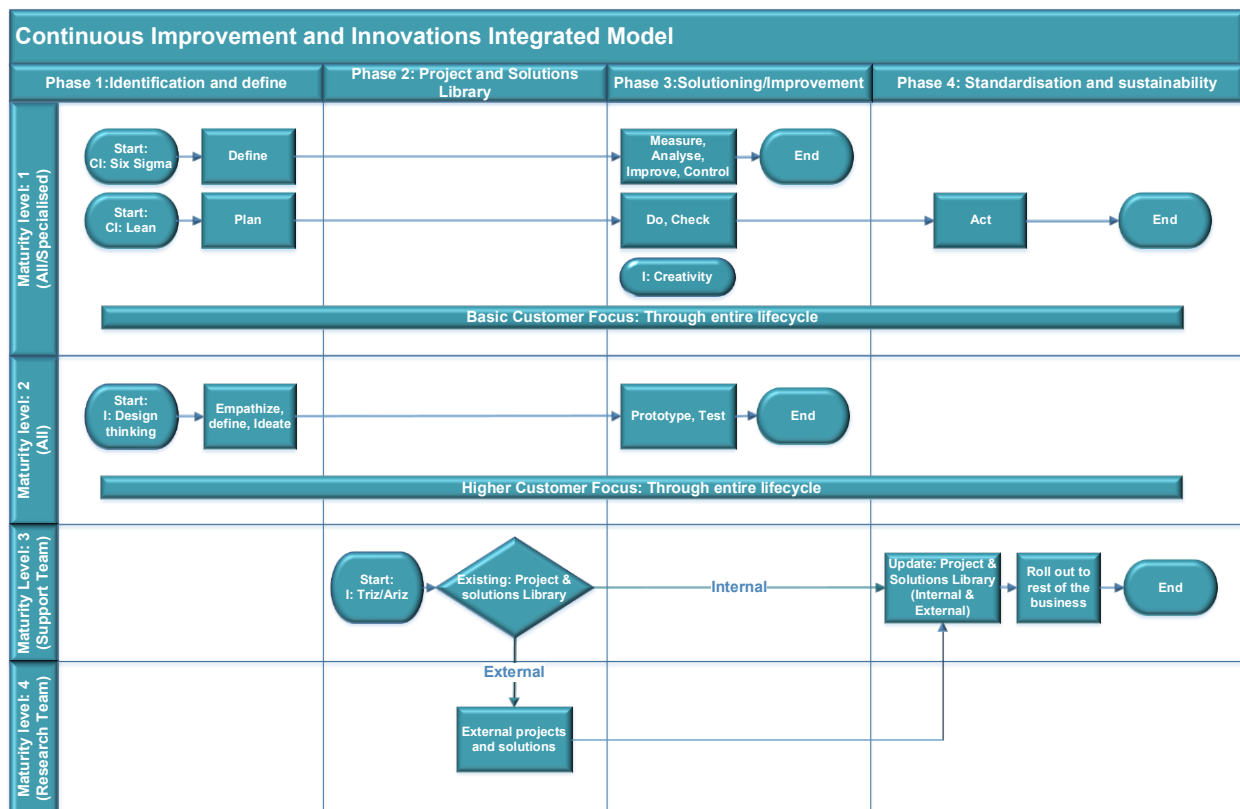


Figure 7-2 Continuous Improvement and Innovations Integrated Conceptual Model

To fully understand the Continuous Improvement and Innovations Integrated Conceptual Model presented in Figure 7-2, it is helpful to navigate its components step by step. The model is structured to visually guide the reader through its phases and maturity levels.

The reader should direct their attention to Phase 1, top-left, which represents the starting point for applying the model. From here, the diagram shows how this element interacts with the methodology steps at each maturity level and how these steps and roles differ across the various organisational maturity levels.

7.3.1 Methodologies

7.3.1.1 Continuous Improvement

Six Sigma is a process improvement methodology that reduces variation through the Define, Measure, Analyse, Improve, and Control process steps, as further unpacked in the Literature Review in Chapter 2.

Lean is a process improvement methodology that streamlines process flow and eliminates or reduces non-value-adding activities (wastes) through the Plan-Do-Check-Act (PDCA) cycle, as further unpacked in the Literature Review in Chapter 2.

7.3.1.2 Innovations

Design Thinking is a human-centred design process that connects customers and businesses and follows the steps of empathise, define, ideate, prototype, and test.

TRIZ/ARIZ (Theory of Inventive Problem Solving) is a systematic approach to innovation that involves creative problem-solving by matching generalised problems and solutions to new problems.

Creativity is the spontaneous development of new ideas and out-of-the-box thinking.

7.3.2 Role-players

The integrated model has the following role-players:

All: This includes all employees in the organisation. All employees should receive basic continuous improvement awareness and problem-solving training, as outlined in the white and yellow belts.

Specialised: The more advanced level of continuous improvement, Green & Black belt, should be considered specialised skills.

Support team: The support team consists of Innovation and Process Representatives. Both are highly skilled in their roles, with comparable levels of skill and practical experience.

Research team: The research team consists of employees who research possible solutions from external companies for a similar internal project problem.

7.3.3 Phases of the model

The model consists of 3 phases:

7.3.3.1 Phase 1: Project Identification and Definition

Phase 1 encompasses the Define phase from the Six Sigma methodology (CI), the Plan phase from the Lean methodology (CI), and the Empathise, Define, and Ideate phases from the Design Thinking methodology (Innovations). A strong focus on the customer is already included in phase 1, which is covered under the CI methodologies, but in much more depth through the addition of the Design thinking methodology. Phase 1 applies to all company employees, typically those at the White and Yellow belt levels, and covers awareness and basic problem-solving in Continuous Improvement methodologies. Green and Black Belts, which involve more advanced problem-solving, should be covered by more specialised process practitioners.

The outcome of phase 1 is a clearly defined problem, the project's 'as is' status, and a clear understanding of customer needs and expectations.

7.3.3.2 Phase 2: Project & Solutions Library

Phase 2 covers TRIZ/ARIZ (Innovation) thinking by developing a Project and Solutions library of existing projects and solutions. The support team needs to assist library employees in determining whether their project has already been implemented across the broader organisation. This will prevent project duplication and wasted employee effort. This will also drive standardisation in the organisation.

The company also needs to be aware of external solutions with similar internal problems. The research team is responsible for researching alternative solutions from external companies.

The outcome of Phase 2 is to determine whether the project identified during Phase 1 is not an existing project that has been completed within the organisation or externally. If yes, the support team can assist the employee in contacting the relevant internal stakeholders, preventing duplication and driving standardisation. If the solution is external, then the research team will assist the employee.

7.3.3.3 Phase 3: Solutioning/Improvement

Phase 3 encompasses the Measure, Analyse, Improve, and Control phases of the Six Sigma Methodology (CI), as well as the Do and Check phases of the Lean Methodology (CI). It also includes the Prototype and Test from the Design Thinking Methodology (I). Creativity from the Innovations methodology is also included during this phase. Although there is no formal methodology for Creativity, the company needs to encourage creative solutions during this stage.

The outcome of Phase 3 is an improved, tested solution to the problem defined in Phase 1.

7.3.3.4 Phase 4: Standardisation and sustainability

Phase 4 covers the Act of Lean (CI), which refers to continuous improvement and rollout. After a project has been completed, the business needs to focus on the next improvement and on rolling out solutions across the rest of the organisation. This phase also covers the TRIZ/ARIZ methodology (Innovations) to update the existing Project and solutions library with newly implemented projects, preventing duplication for the business. After a process has been optimised or new designs and improvements have been made, the solution needs to be rolled out to the rest of the business to drive standardisation.

The outcome of Phase 4 is an updated library with the latest project solutions for the rest of the business and projects implemented, rolled out to the rest of the organisation to drive standardisation.

7.3.4 Maturity Level of the Organisation

Although the model refers to maturity levels, it is not a Maturity model. The maturity level of an organisation refers to the level of growth and exposure the company has regarding processes and Innovation Thinking. Level 1 is beginner-level, and Level 4 is the advanced maturity level in Continuous Improvement and Innovation Thinking.

7.3.4.1 Maturity Level 1

This level includes the CI methodologies of Six Sigma (DMAIC) and Lean (PDCA) or/and the combined Lean Six Sigma. A company at maturity level 1 should start with Continuous Improvement as the basis for its CI and Innovation journey, building on a strong CI foundation. Although there are no formal methodology steps and guidelines for Creativity (Innovations), the company must encourage creative solutions and out-of-the-box thinking.

7.3.4.2 Maturity Level 2

After a company has reached a strong maturity level 1, it can build its level 2 maturity by increasing its customer focus to a higher level, as covered in Level 1, for all employees. High customer focus should be built throughout the project lifecycle through the Innovation methodology design thinking, which includes Empathy, definition, ideation, prototyping, and testing. Although there are no formal methodology steps and guidelines for Creativity (I), the company must encourage creative solutions and out-of-the-box thinking.

7.3.4.3 Maturity Level 3

After a company has reached mature levels 1 and 2, it should focus on level 3 by introducing the Innovation methodology TRIZ/ARIZ during phases 2 and 4. This is done by building a library of existing CI and Innovations projects and solutions for the company. The support team needs to be familiar with the project library and the relevant stakeholders to assist employees with their projects and company networking. This will help employees avoid reinventing the wheel and eliminate project duplication for the company. The library needs to be updated at stage 4, after the new projects have been implemented, to ensure it is up to date with the latest completed internal projects and solutions. The Innovation methodology should also encourage creativity during phase 3 for project solutions. Although there are no formal methodology steps and

guidelines for Creativity (I), the company must encourage creative solutions and out-of-the-box thinking.

7.3.4.4 Maturity Level 4

After a company has reached maturity Levels 1-3, it can focus on Level 4 maturity. At Level 4, the Research team is primarily responsible for exploring external solutions for projects identified during Phase 2. The library needs to be updated at stage 4, after the new projects have been implemented, to ensure it is up to date with the latest completed projects and solutions.

7.4 Conclusion

This chapter outlined the key design requirements from the literature and empirical investigation. These requirements form the foundation for the proposed conceptual model. They ensure the model is relevant, implementable, and capable of addressing the root causes of the lack of integration between CI and Innovation Thinking in the banking sector.

CHAPTER 8 PHASE 4: DELPHI STUDY

8.1 Chapter Orientation

This chapter explains how the Delphi technique was used to verify and validate (evaluate) the new integrated CII Integration model. The purpose of the Delphi was to determine whether there was consensus regarding the new integrated model.

Figure 8-1 indicates the position of the current chapter within the bigger report structure.

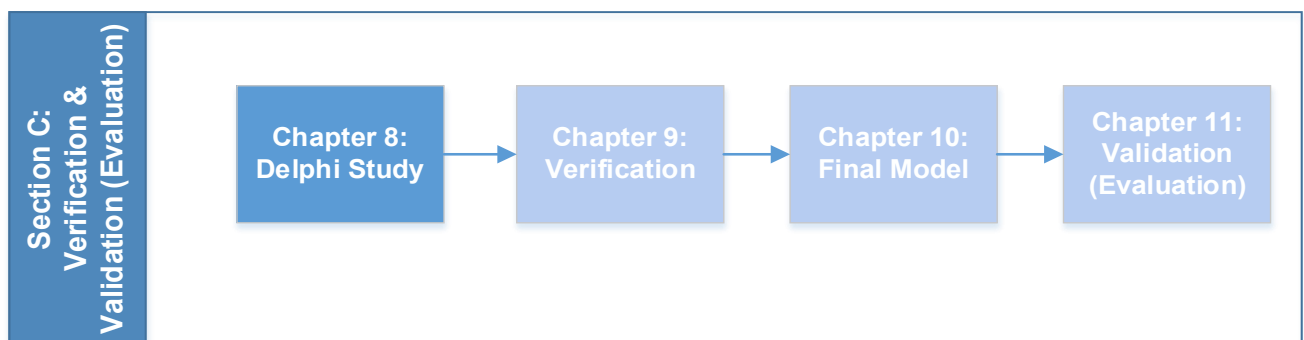


Figure 8-1: Report Structure: Delphi Study

This chapter presents the Delphi study (Phase 4 Artefact conducted to validate the newly developed Continuous Improvement and Innovation Integration Model (CII Integration Model). The Delphi technique was employed to achieve expert consensus on the model's relevance, structure, and practical feasibility. Through two iterative rounds involving 13 South African banking sector experts, feedback was gathered, analysed, and used to refine the model before final implementation. This chapter contributes to the broader project in several ways:

It achieves expert consensus on the model's relevance and usability within the South African banking sector.

It provides iterative refinements to clarify support team roles and simplify maturity criteria.

It integrates a practical banking use case to demonstrate the model's real-world applicability.

It utilises anonymous feedback loops to mitigate groupthink and researcher bias during the evaluation.

The insights gained in this chapter were used to finalise the CII Integration Model's features and implementation guidelines.

8.2 Overview of the Delphi Method

The Delphi method is a structured group communication process used to gather knowledge from a panel of experts through multiple questionnaires. It supports consensus-building in fields where subjective judgment is critical. The method involves anonymous responses, controlled feedback, and statistical aggregation of group responses, making it ideal for evaluating conceptual models. In this study, the Delphi technique allowed for the structured refinement of the model through iterative expert input.

8.3 Participant Selection

Thirteen experts were purposively selected from the case bank for their dual expertise in Continuous Improvement and Innovation Thinking. Criteria included a minimum of Green Belt certification in Lean Six Sigma and formal designation as Innovation Representatives. Participants represented departments such as Operations, Customer Experience, Process, Architecture and Management. The demographic profile of the participants is presented in the table below.

Table 8-1: Participant Demographics

Participant	Job Title	Job level	CI Experience	Innovations Experience
1	Solution Strategist	Middle Management	Lean Six Sigma Green Belt	Innovation Representative
2	Business Process Engineer	Middle Management	Lean Six Sigma Green Belt, busy with Lean Six Sigma Black Belt	Innovations Representative
3	Office Support Manager	Middle Management	Lean Six Sigma Green Belt	Innovations Representative
4	Talent Management Specialist	Middle Management	Lean Six Sigma Green Belt	Innovations Representative, Design Thinking Course
5	Process Engineering Lead	Senior Management	Lean Six Sigma Green Belt	Innovations Representative
6	Solution Strategist	Middle Management	Lean Six Sigma Green Belt	Innovations Representative,
7	Business Solutions Manager	Senior Management	Lean Six Sigma Green Belt	Innovations Representative
8	Sales Operations Manager	Senior Management	Lean Six Sigma Green Belt	Innovations Representative,

Participant	Job Title	Job level	CI Experience	Innovations Experience
				GIBS Innovations Course
9	Credit Head	Senior Management	Lean Six Sigma Green Belt	Innovations Representative,
10	Business Architect	Middle Management	Lean Six Sigma Green Belt	Innovations Representative, Innovations Course through MBA
11	Business Architect	Middle Management	Lean Six Sigma Green Belt, busy with Black Belt	Innovations Representative
12	Process Engineering Lead	Senior Management	Lean Six Sigma Green Belt, busy with Lean Six Sigma Black Belt	Innovations Representative
13	Process Analyst	Middle Management	Lean Six Sigma Green Belt	Innovations Representative

8.4 Round 1 Procedure

In Round 1, participants received a questionnaire and the initial version of the model via email. They were asked to evaluate the model's clarity, structure, feasibility, role-player alignment, phase sequencing, and maturity levels. Likert-scale responses were used alongside open-ended comment boxes. The Likert-scale categories for each question are shown in Table 8-2.

The questionnaire consisted of the following sections and questions:

Table 8-2: Participant questions for Delphi 1

Section	Questions
Section 1: General Understanding	Question: How familiar are you with the methodologies included in the Continuous Improvement and Innovations Integrated Model (Lean, Six Sigma, Design Thinking, TRIZ/ARIZ, Creativity)? Format: Likert Scale: Very familiar, somewhat familiar, neutral, somewhat unfamiliar and very unfamiliar. Question: Briefly elaborate on your familiarity with the methodologies included (Lean, Six Sigma, Design Thinking, TRIZ/ARIZ, Creativity)? Format: Open-Ended Note: Participants were asked to indicate the general methodologies they are familiar with during the interview

Section	Questions
	stages. The question above refers to the specific methods that were built into the model. Thus, they were asked about their familiarity with the methodologies they identified during the interview stage. Question: Please indicate how much you agree with the following statement: An integrated approach to Continuous Improvement and Innovation can enhance problem-solving and efficiency within organisations. Format: Likert Scale: Strongly agree, agree, neutral, disagree and strongly disagree.
Section 2: Model Structure & Methodologies	Question: Do you agree with the inclusion of Lean and Six Sigma as the core Continuous Improvement methodologies? Format: Yes/No Question: If you answered "No," please provide an alternative suggestion. Format: Open-ended Question: Do you agree with the inclusion of Design Thinking, TRIZ/ARIZ, and Creativity as the core Innovation methodologies? Format: Yes/No Question: If you answered No, please make an alternative suggestion Format: Open-ended Question: Are there any additional methodologies that should be included in the model? Format: Open-ended Question: The model is structured into four phases (Identification, Solutions Library, Solutioning/Improvement, and Standardisation). Do you find this framework logical and effective? Format: Yes/No Question: If you find the framework ineffective, what alternative would you suggest? Format: Open-ended
Section 3: Implementation & Practicality	Question: How effective do you think the Solutions Library concept is in preventing project duplication and driving standardisation? Format: Likert Scale: Very effective, somewhat effective, neutral, somewhat ineffective, very ineffective Question: Do you believe the maturity levels (1-4) adequately represent an organisation's progress in CI & Innovation? Format: Yes/No

Section	Questions
	Question: What alternative suggestions could you make to represent an organisation's progress in CI & Innovation? Format: Open-ended Question: What challenges do you foresee in implementing this model within this organisation? Format: Open-ended Question: Do you have any additional recommendations to enhance the model's applicability? Format: Open-ended

It is acknowledged that providing pre-selected items in Delphi Round 1 introduced a risk of anchoring bias, which is recorded as a limitation (Hasson & Keeney, 2011). To maintain confirmability, the study utilised controlled feedback, allowing experts to refine their perspectives based on the full range of responses without forced consensus (Brady, 2015). Reflexive journaling was also used to 'bracket' the researcher's preconceptions, ensuring that consensus was driven by participant expertise rather than by researcher-led anchors (Brady, 2015; Lincoln & Guba, 1985). It is important to note that although some questions required a yes/no answer, follow-up questions allowed participants to suggest alternatives and provide more detailed insights.

The results of the first round of the Delphi questionnaires were analysed. The findings from this round are presented below, organised by category and question for ease of reference.

8.4.1 Section 1: General Understanding

The general understanding was determined by a) Participants' familiarity with methodologies and b) the participants' agreement with the statement that an integrated approach to Continuous Improvement and Innovation can enhance problem-solving and efficiency within organisations (Refer to Table 7-2, Section 1).

Participants indicated a general familiarity with the methodologies included in the conceptual model. 33% of participants indicated they are very familiar with the methodologies, 45% somewhat familiar, 22% neutral, 0% somewhat unfamiliar, and 0% very unfamiliar.

Although the participants in this study had both CI and Innovations training and/or exposure in their roles, they were not very familiar with the specific innovation methodologies (theory) included. This is consistent with the Scoping Review's findings (Chapter 4), which indicate that formal training in innovation methodology is limited across all disciplines. At this organisation specifically, there is no formal Innovation Methodology training for Innovation representatives.

The participant indicated that the organisation places greater emphasis on an innovation mindset. Innovations Representatives are therefore measured on the practical application of innovation strategies, not on the application of Innovation methodology (theory).

Following the interviews, participants were more familiar with CI methodologies and specific tools than with other methodologies.

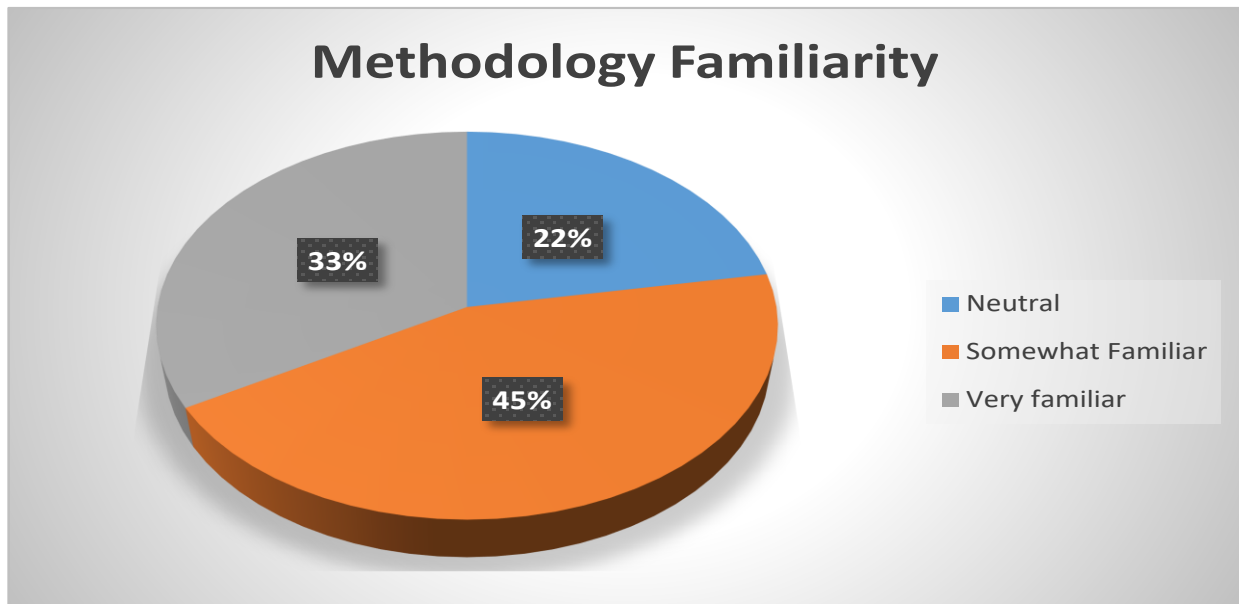


Figure 8-2: Methodology familiarity

Participants' feedback supported the statement that an integrated approach to CI and Innovations can enhance problem-solving and efficiency within the organisation: 67% strongly agreed, 22% agreed, 11% were neutral, 0% disagreed, and 0% strongly disagreed.

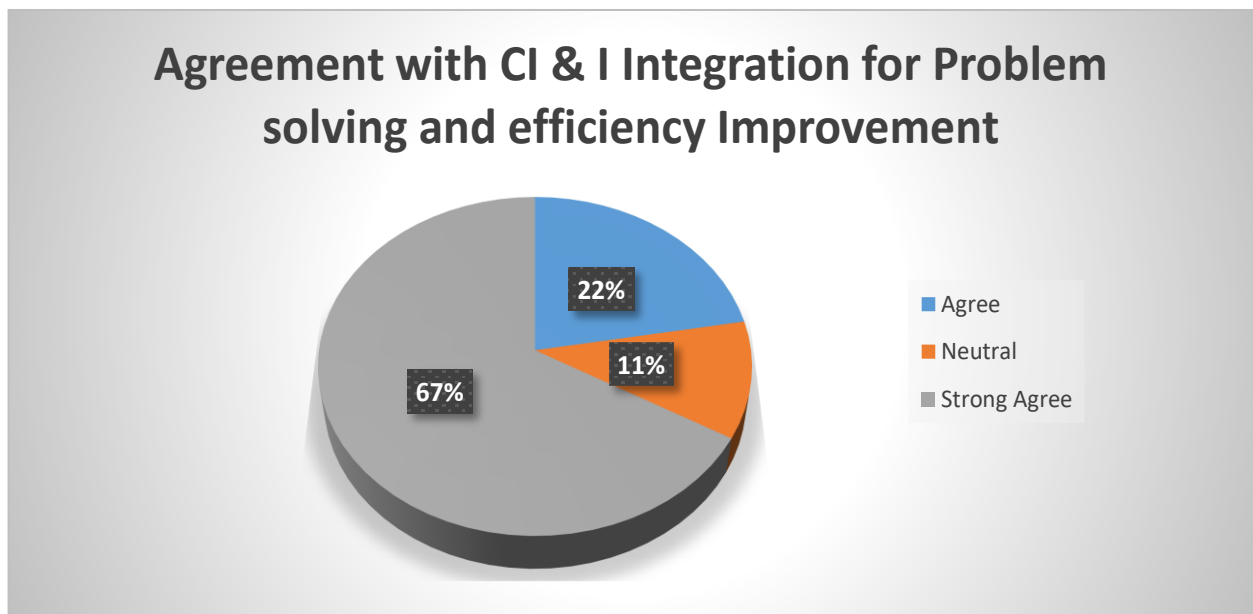


Figure 8-3: Agreement with CI and Innovations integration for problem-solving and efficiency improvement

8.4.2 Section 2: Model Structure & Methodologies

The participants' agreement with the model and methodologies was determined by a) agreement with core CI methodologies, b) agreement with core Innovations methodologies, and c) agreement with the four-phased approach of the framework (Refer to Table 7-1, Section 2).

All the participants (100%) agreed, and none (0%) disagreed, that Lean and Six Sigma are the core of continuous improvement methodologies.

Most participants (89%) indicated that Design Thinking, TRIZ/ARIZ, and Creativity are the core methodologies for innovation. Only 11% indicated otherwise, as the participants were unfamiliar with typical innovation methodologies. This was due to participants not receiving formal Innovations Methodology training, but rather relying mainly on informal training and exposure to methodologies through projects. This was also a gap identified during the scoping review research.

Agreement that Design Thinking, Triz/Ariz and Creativity as core for I methodologies

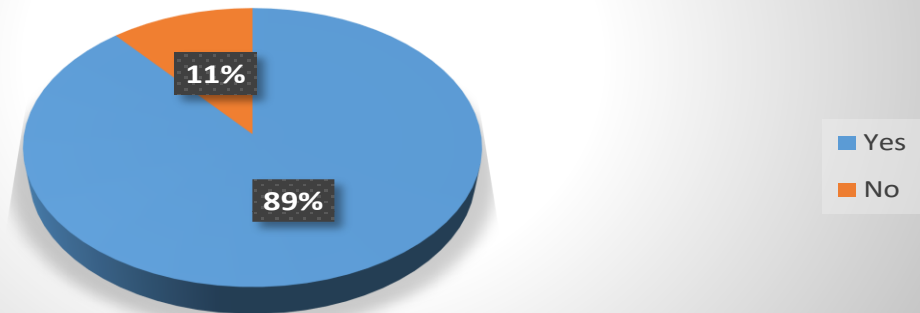


Figure 8-4: Agreement that Design thinking, TRIZ/ARIZ, and Creativity are core for Innovation methodologies

All participants (100%) agreed that the four proposed phases (Identification, Solutions Library, Solution/Improvement, and Standardisation) are logical and effective, and none (0%) disagreed.

8.4.3 Section 3: Implementation & Practicality

The participants' agreement with the implementation and practicality was determined by a) agreement on the solutions library's effectiveness, b) inclusion of different maturity levels, and c) foreseen challenges with the model implementation (Refer to Table 7-2, Section 3).

56% of the participants indicated that the Solutions Library concepts are very effective in preventing project duplication and driving standardisation; 44% stated that they are somewhat effective; 0% indicated neutral; 0% somewhat ineffective; and 0% very ineffective.

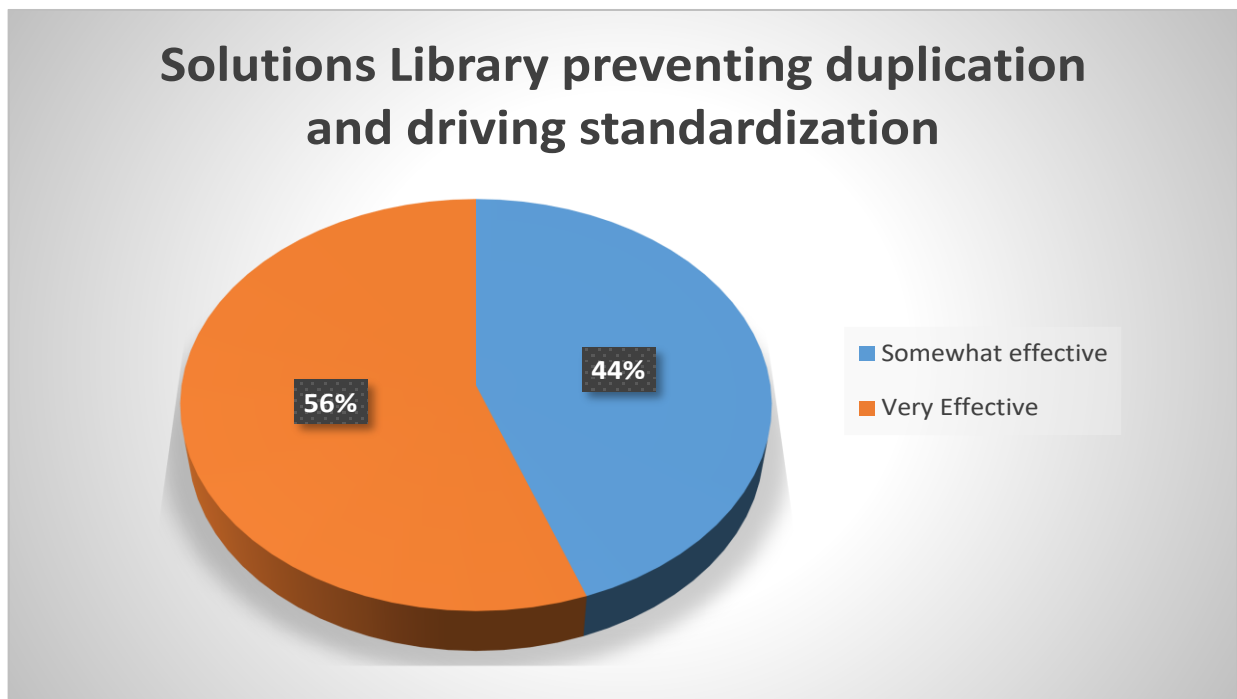


Figure 8-5: Solutions library preventing duplication and driving standardisation

Question: Do you believe the maturity levels (1-4) adequately represent an organisation's progress in CI & Innovation?

All (100%) of the participants agreed that the maturity levels (1-4) adequately represent an organisation's progress in CI and Innovation Thinking, and none (0%) disagreed.

8.4.4 Changes required for round 2 of the Delphi study

Based on participants' responses, different categories of changes to the conceptual model were identified to improve it. In the open-ended responses, participants indicated a need for the model to address the following:

8.4.4.1 Relevance and Benefits

Participants requested more details on the relevance and benefits of CI and Innovation Thinking in the banking industry.

8.4.4.2 Methodology clarification and relevance

As participants indicated during Round 1 that there is some confusion among the CI and Innovations methodologies, the accompanying tools, and the steps to follow, some clarification was needed. Participants requested that the CI and Innovations methodologies, steps, and tools be discussed in more detail, as additional clarity was required for some of them and the rationale behind specific methodologies.

8.4.4.3 Maturity level summary and simplification

Participants referred to the need for a summary and/or simplification of maturity levels and phases, which was included in the second iteration of the model.

8.4.4.4 CII Integration Model challenges and proposed solutions

The participant identified several potential challenges associated with implementing the proposed integration model. These challenges included change management, project and solutions library maintenance, resource allocation and expertise, organisational silos, and Innovation fatigue. Each challenge was unpacked, and solutions were proposed.

8.4.4.5 Practical example demonstration

Participants requested an example after Round 1 to demonstrate the practical implementation of the integrated model. A bank's approach to improving customer onboarding was included as a practical example in banking.

These insights informed refinements to the model before the second round.

8.4.5 Qualitative feedback highlighted:

The key takeaways from this round were that the following needed to be addressed:

The confusion between the Support and Research team roles

There is a need for more guidance on Phase 2 (Project and Solutions Library)

More details regarding methodologies

Simplification of maturity level criteria

Identified potential challenges with implementing the model

Requested a practical example

8.5 Round 2 Procedure

A revised model (Chapter 10 CII Integration Model) was shared with participants, incorporating changes based on Round 1 feedback. The revised model highlighted the relevance and benefits of an integrated CI and Innovations model by emphasising the need for such an approach. The revised model included more detailed descriptions of the methodologies and the rationale for the specific methodologies used for Six Sigma, Lean, Lean Six Sigma, Design Thinking, TRIZ/ARIZ,

and Creativity. A summary and simplification of the phases and maturity levels were also added to the revised model. Challenges and proposed solutions were included for change management, Project and solution Library, Resource allocation and expertise, organisation silos, and Innovation fatigue. A practical banking example on how to implement the integrated model is also included in the revised model. Round 2 focused on confirming consensus on adjusted components and validating unresolved areas.

The consensus threshold was set at $\geq 80\%$ agreement on Likert-scale items. Open-ended questions were used for final clarification where needed. Consensus was reached on all major components as described in 8-3: Consensus Achieved on Major Components

The Round 2 questionnaire consisted of the following sections and questions:

Table 8-3: Participant questions for Delphi 2

Section	Questions
Section 1: Expanded methodologies	Based on feedback received during Round 1, the detailed descriptions of Six Sigma (DMAIC) tools (e.g., SIPOC, 5 Whys, DOE, SPC) have been added for clarity. Do you believe this makes the model more actionable? Format: Likert scale: Strongly agree, agree, neutral, disagree, strongly disagree. Question: If you did not agree with the refined methodology in question 1, please explain why here. Format: Open-ended. Question: The Lean methodology section was expanded to explain each step in the PDCA cycle fully. Is this level of detail appropriate for the model's intended audience? Format: Likert scale: Yes, it adds useful clarity, not sure, no, it may be too technical. The Innovations methodologies were explained in full detail. Is this level of detail appropriate for the model's intended audience? Question: A new "Why These Methodologies" section was added, citing relevance to the banking sector, familiarity, and proven success. Do you support these as appropriate selection criteria? Format: Yes/No Question: Please motivate your answer to Question 4. Format: Open-ended.
Section 2: Implemented challenges	Question: The model now includes six implementation challenges and proposed solutions. How useful do you find this addition for guiding real-world rollout? Format: Likert scale: Extremely useful, somewhat useful, neutral, somewhat not useful, extremely not useful. Question: Do you have additional implementation challenges or refinements to propose? Format: Open-ended.

Section	Questions
Section 3: Model practicality & examples	Question: The revised model now includes a real-world example (bank customer onboarding) illustrating how the phases and maturity levels work in practice. Does this improve your understanding of the model's application? Format: Yes/No Question: Please share additional comments about the inclusion of the real-world example and your understanding of the model's application. Format: Open-ended. Question: Would you recommend adding more department-specific examples? Format: Yes/No Question: If you answered yes (Question 10), please include the department-specific example that should be included below Format: Open-ended.
Section 4: Final input	Question: Do you believe the model now provides sufficient guidance for implementation in organisations? Format: Yes/No Question: If you answered no (Question 12), please provide additional suggestions to improve the model Format: Open-ended. Question: Do you have any additional feedback on this revised version of the model? Format: Open-ended.

The results of the above questions were analysed. Below is a summary of the results per category.

8.6 Consensus Achieved

Consensus was reached on all major components of the model, as summarised in Table 8-4 below. The agreement is calculated by the participants' feedback as a percentage:

Table 8-4: Consensus Achieved on Major Components

Model element	Round 2 Agreement (%)	Consensus Achieved?
Relevance and Benefits	88%	Yes
Methodology clarification and relevance	100%	Yes
CII Integration Model challenges and proposed solutions	88%	Yes
Practical example demonstration	100%	Yes
Sufficient guidance	100%	Yes

8.7 Reflections on the Delphi Process

Participants appreciated the transparency, responsiveness to feedback, and structured opportunity to refine the model. The Delphi process reinforced the model's practical relevance and helped adapt its structure to the bank's operational realities. The Delphi process helped refine the model for different maturity levels, phases, and role players. The model suggests that integration between CI and Innovation Thinking is possible, but it requires following a structured approach. The phased approach outlined in the current model enables different areas to implement it step by step, making it more manageable. Each area's CI and Innovation maturity levels differ, and therefore, the model has been developed to cater to each maturity level. Some variation in how maturity levels were interpreted suggests the need for flexible application guidelines during rollout and onboarding. While the Delphi instrument sought consensus, the analysis intentionally looked for discrepant data, where participants expressed scepticism or identified hurdles, to ensure the report was not one-sided (Nowell et al., 2017). This reflexive approach ensures confirmability, meaning the findings are a neutral reflection of expert opinion rather than researcher assumptions (Ahmed, 2024).

8.8 Conclusion

The Delphi study successfully validated the Integrated CI-Innovation Model. Expert consensus was achieved on all core dimensions, and the iterative feedback significantly enhanced model clarity, relevance, and usability. As discussed in the next chapter, these findings confirm the model's readiness for implementation and further validation (evaluation).

CHAPTER 9 VERIFICATION OF MODEL DESIGN

9.1 Chapter Orientation

The research report is broken down into 12 Chapters and four sections. Figure 9-1 indicates the position of the current chapter within the bigger report structure.

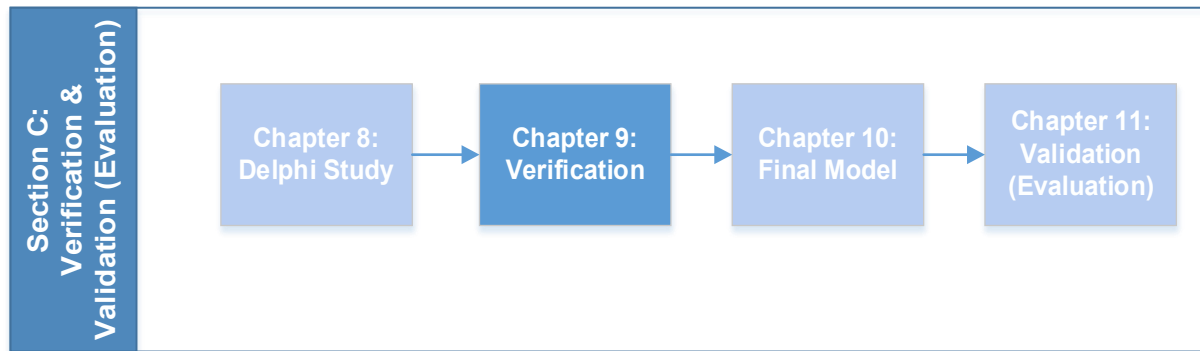


Figure 9-1: Report Structure: Verification

It contributes to the research project in several ways:

- It provides a compliance matrix demonstrating a one-to-one relationship between design requirements and model features.
- It conducts a design-trace review to ensure the artefact addresses all barriers identified in Phase 2.
- It validates that the final model satisfies the $\geq 80\%$ consensus threshold established in the Delphi study.
- It confirms the model's structural readiness for implementation within the bank. The insights gained in this chapter ensure that the model is fit for purpose and methodologically verified before final presentation.

9.2 Introduction

This chapter summarises the verification of the CII Integration Model, which adheres to the design requirements established in Chapter 6. Chapters 6-8 have formalised the design requirements, presented the conceptual model, and refined this model through two Delphi rounds. This chapter finalises the model by confirming that the final model satisfies the design requirements presented in Table 8-4.

9.3 Verification Methodology

The validation (qualitative evaluation) and verification that the final model meets design requirements proceeded on two complementary fronts. First, a design-trace review was conducted. This involved mapping every requirement retrospectively to the corresponding feature in the final model, drawing on the annotated model diagram, role matrix, maturity ladder, and solutions-library schematic presented in Chapter 7. This mapping produced a compliance matrix (Addendum E) that demonstrates a one-to-one relationship between design intent and implementation.

Second, external confirmation was obtained through the two-round Delphi study reported in Chapter 8. Thirteen banking experts assessed the relevance, clarity, and practicality of each model component; consensus was defined a priori as $\geq 80\%$ agreement on Likert-scaled items. All nineteen validation items met or exceeded this threshold after the second round (Table 8-3).

By triangulating the internal design-trace with independent expert consensus, the study satisfies the dual criteria of methodological rigour and practitioner validity, ensuring that the final model both fulfils its original specifications and is judged feasible for real-world application in the banking industry.

9.4 Retrospective View: Addressing Design Requirements

The design requirements were outlined in Chapter 6, and subsequently, the conceptual model was developed and illustrated in Chapter 7. The Delphi technique was employed to validate the CII Integration Model and assess whether a consensus existed regarding its implementation. The table below indicates the link to the design requirements set out in Chapter 6.

Table 9-1: Design Requirements addressed by CII Model

Requirement	How the CII Integration Model Addresses It
FR1	Integration is achieved in the composite diagram (Figure 10-2), which combines DMAIC/PDCA and Design-Thinking/TRIZ.
FR2	A step-by-step, four-phase workflow is presented in Figure 7-2 and described in Section 10.5.4, providing a structured sequence from problem definition to standardisation.
FR3	Iterative refinement is embedded in Phase 3 (Section 10.5.4.3), which combines DMAIC “Improve–Control” loops with Design-Thinking prototype/testing cycles.
FR4	Incremental (CI) and radical (Innovation) value creation converge within each phase of Figure 10-2, ensuring simultaneous pursuit of efficiency and novelty.

Requirement	How the CII Integration Model Addresses It
CR1	Banking industry conditions are emphasised in the “Plan/Define” step of Phase 1 (see Section 10.5.4.1) and reinforced by controlled rollout in Phase 4 (See Section 10.5.4.4).
CR2	Cross-functional Support and Research teams (See Section 10.5.3) bridge siloed departments, mediating CI and Innovation projects across organisational structures.
CR3	Resource-constraint guidance is provided in the Resource Allocation & Expertise subsection (See Section 10.5.4.3), which prescribes forecasting and workload balancing.
CR4	A four-level maturity ladder (See Figure 8-1, Section 10.5.5) allows units with differing capabilities to adopt the model progressively.
PR1	Lean-Six-Sigma routines are detailed in Section 10.5.4.1, embedding DMAIC and PDCA within Phase 1 and Phase 3 activities.
PR2	Design-Thinking and TRIZ/ARIZ tools are fully described in Section 10.5 and mapped to Phases 1 and 2, respectively.
PR3	The maturity ladder (Figure 8-1) doubles as a scaling roadmap, satisfying the requirement for graduated adoption (See Section 10.5.5).
PR4	Parallel CI and Innovation tasks appear side-by-side in the integrated diagram (Figure 10-2), illustrating concurrent execution.
RR1	Belt-level responsibilities (White/Yellow / Black belt) and Innovation roles are tabulated in Section 10.5.3 under Role-players.
RR2	A dedicated CI–Innovation Support Team and Research Team are defined in Section 10.5.3 and act as bridging roles between the process and innovation functions.
RR3	The Research Team's workflow for external solution scouting is described in Phase 2 (See Section 10.5.4.2).
RR4	Upskilling pathways are built into the model via belt progression and the training roadmap cited under Change Management (See Section 10.5.4.4).
SR1	A searchable Project & Solutions Library is specified in Phase 2 (See Section 10.5.4.2), and its maintenance challenges are addressed in Section 10.5.6.2.
SR2	KPI and BI integration points are outlined in the Phase 4 focus on continuous measurement and rollout (See Section 10.5.4.4).
SR3	Communication aids (templates, storyboards) are included in the model toolkit referenced in Section 10.5.6 (Implementation Challenges).

9.5 Summary of Cross-Verification

Table 9-2 below shows how each requirement was confirmed using the three verification mechanisms.

Table 9-2: Summary of Cross-Verification

Design-requirement group (IDs)	Design-trace review	Delphi consensus	Conclusion
Functional (F1 – F4)	✓	✓	Verified
Contextual (C1 – C4)	✓	✓	Verified
Process (P1 – P4)	✓	✓	Verified
Roles (R1 – R4)	✓	✓	Verified
Systems (S1 – S3)	✓	✓	Verified

All five requirement groups meet both internal design-trace criteria and external expert consensus, confirming that the final Model fully satisfies the design requirements established in Chapter 6.

9.6 Conclusion

This chapter confirms that the CII Integration Model satisfies all design requirements. The verification strategy, using design traceability and Delphi feedback, demonstrates that the model is functional, relevant, feasible, and aligned with the complex realities of South African banking operations.

CHAPTER 10 CONTINUOUS IMPROVEMENT AND INNOVATION INTEGRATION MODEL (CII INTEGRATION MODEL)

10.1 Chapter Orientation

The research report is organised into 12 chapters and four sections. Figure 10-1 illustrates the current chapter's place in the report's overall structure.

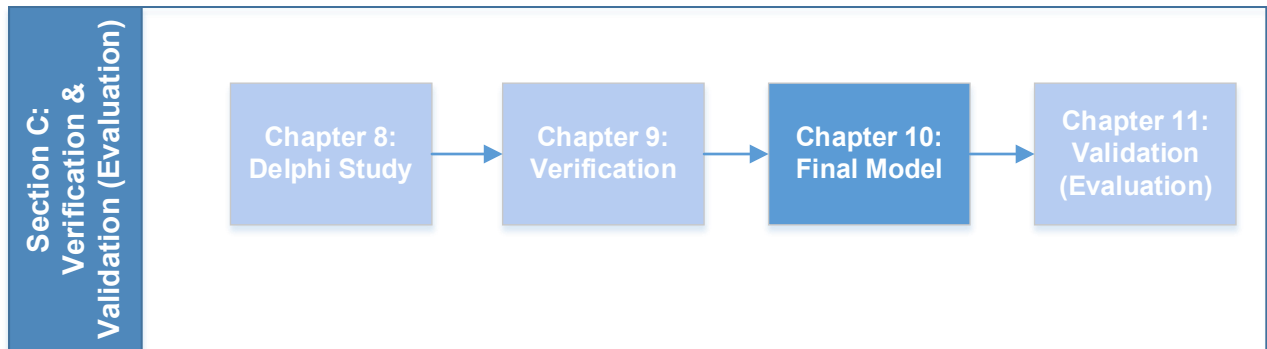


Figure 10-1: Report Structure: Final Model

The CII Integration Model was developed from Rounds 1 and 2 of the Delphi Study (Chapter 8). The CII Integration Model was refined based on their feedback in Round 1, and consensus was achieved during Round 2.

This chapter thus presents the primary research output: the finalised CII Integration Model. It contributes to the project in several ways:

- It provides a comprehensive roadmap for integrating CI and Innovation Thinking tailored for South African banking.
- It outlines the specific responsibilities of the CI–Innovation Support and Research teams.
- It outlines solutions for implementation challenges, such as change management and resource allocation.
- It illustrates the model's application through a detailed customer onboarding use case. The CII Integration Model documents the "To-Be" state for organisational renewal, providing a practical tool for maintaining competitive advantage.

10.2 Development of CII Integration Model

The development of the new CII Integration model was based on the theoretical scaffolding of the Literature review (Chapter 2), the findings of the Scoping review (Chapter 4), and participant interview feedback (Chapter 5).

The preferred CI and Innovations methodology and methodology step integration for the new integrated model were also developed based on the above sources. For example, Lean, Six Sigma, and combined Lean Six Sigma were the most frequently used in the banking industry case study (Richards & Coetzee, 2026b), as discussed in Chapter 5. Therefore, the CI methodologies selected to build the new CII Integration model were Lean and Six Sigma. The most frequently used Innovation methodologies were Ariz/Triz and Design Thinking (Richards & Coetzee, 2026b). Therefore, the Ariz/Triz and Design thinking Innovations methodologies were used to develop the new CII Integration model.

The integration and overlap of the CI Six Sigma (DMAIC) and Lean methodology steps (PDCA) were unpacked in Table 2-3. The overlap and integration were further unpacked in Section 7.2.1 and Table 7-1. The integration and overlap between CI's Six Sigma & Lean methodology steps and Innovations' Design Thinking steps were unpacked in Table 7-2.

The maturity levels and role requirements were developed based on feedback from participants in Chapter 5 during the participant interviews. The different role players were suggested during the interviews. The participants, thereafter, requested, in Round 1 of the Delphi study, a more in-depth breakdown of the role players, which was provided in Chapter 10 under 10.5.3.

In Chapter 8, participants offered various suggestions to improve the model following Round 1 of the Delphi technique. The revisions were implemented as presented in Table 10-1 below.

Table 10-1: Suggested Changes to Model

Participant Feedback	Supporting Source	Revision applied
Address the confusion between the Support and Research team roles.	Delphi Round 1 questionnaires and practical suggestions were made concerning the roles of support team members.	Team member roles were clarified. Refer to section 10.5.3 under Role players.
There is a need for more guidance on Phase 2 (Project and Solutions Library).	Delphi Round 1 questionnaires and examples were provided during the interviews around the solutions libraries.	Guidance provided on Phase 2. Refer to section 10.5.4 under phases.
Simplification of maturity level criteria.	Delphi Round 1 questionnaire.	Maturity level criteria were simplified. Refer to section

Participant Feedback	Supporting Source	Revision applied
		10.5.5 regarding the organisation's maturity level.
Identified potential challenges with implementing the model	Delphi Round 1 questionnaire, Interview data, and Dynamic Capabilities theory application.	Common challenges identified, along with possible practical solutions, were presented in this organisation's context. Refer to section 10.5.6 for information on challenges and how to overcome them.
Requested a practical example	Delphi Round 1	A common service industry (banking) was included. Refer to section 10.5.7 for a practical example of the integrated model.

The participants also identified potential challenges that they foresee when implementing the CII Integration Model. Each challenge has been discussed in detail, along with possible solutions to overcome them. These solutions were developed through a review of the literature and participants' suggestions. For example, change management was identified as a general roadblock for new projects and approaches that the bank typically wants to introduce. The recommendations for overcoming change management challenges were developed based on participants' feedback and experience. These were included to make it as practical as possible to implement the CII Integration Model. A useful example was also included to guide users in using the model and to increase the practical application of the CII Integration Model. This example was chosen because it is a common scenario that employees would encounter in this case study organisation.

The revisions were implemented by triangulating the data from the Delphi technique (Chapter 8), the scoping review findings (Chapter 4), the interview data (Chapter 5), and a theoretical lens. Additionally, based on participants' feedback, a section was included to explain the use and inclusion of the methodologies in this model. Although such inclusion is not always necessary in step-based models, a clear rationale and explanation helped participants verify the final model. The employees will receive formal training tailored to their specific roles. As a result, their understanding of the various methodologies and steps, including their overlaps, will be sufficiently clear for them to follow the CII Integration Model. Employees' competence will be developed through projects, learning-by-doing, and on-the-job training. The final iteration of the model was refined by triangulating Delphi feedback with the theoretical lens of Dynamic Capabilities Theory. To strengthen the model's clarity and strategic depth, a fundamental shift was made to explicitly

separate Operational Capabilities (H1 focus) from Dynamic Capabilities (H2–H3 focus), enabling the bank to manage multiple horizons of change in parallel.

To ensure the CII Integration Model is both theoretically sound and practically relevant, it was constructed through a rigorous, iterative Design Science Research (DSR) cycle. Each research phase served as a critical building block, contributing specific information that was translated into model features, while the decision-making process was underpinned by established qualitative trustworthiness frameworks.

The following sections detail how each information source contributed to the artefact's construction and the methodological rigour applied to each stage.

10.2.1 Phase 1 (Scoping Review): Defining the Structural Foundation

Information Contribution: The scoping review identified the global state of the art and confirmed a significant gap in integrated models in service-based sectors such as banking. It provided the methodological base, identifying Lean, Six Sigma, and Design Thinking as the core frameworks to be integrated.

Building the Model: This information was used to define the methodological overlap (e.g., mapping DMAIC and PDCA steps to Design Thinking), which became the model's functional core.

Rigour in Decision-Making: To minimise selection bias and ensure transparency, the review followed the PRISMA-ScR principles. Data were systematically charted using a five-stage framework (Arksey & O'Malley, 2005) to ensure that methodologies were included based on objective frequency and relevance rather than on researcher intuition.

10.2.2 Phase 2 (Individual Interviews): Grounding in Contextual Reality

Information Contribution: Interviews with banking practitioners identified seven primary barriers to integration, including siloed structures, lack of clear frameworks, and role confusion.

Building the Model: These findings contributed to the Contextual and Role requirements. For example, the identified confusion between "process" and "innovation" teams led to the creation of the CI–Innovation Support and Research Team roles within the model.

Rigour in Decision-Making: The decision-making process relied on thematic analysis in ATLAS.ti, enabling the structured reduction of complex data into meaningful segments. To ensure credibility and confirmability, the researcher utilised independent inductive co-coding, resolving coding discrepancies through consensus discussions to limit individual bias.

10.2.3 Phase 3 (Artefact Design): Translating Insights into Requirements

Information Contribution: Information from the first two phases was synthesised into 18 testable design requirements.

Building the Model: These requirements were mapped to the Dynamic Capabilities Theory (DCT) meta-capabilities of sensing, seizing, and transforming. This ensured the model was not just a list of tools but a strategic engine for organisational renewal.

Rigour in Decision-Making: Rigour was maintained through conceptual coherence, ensuring that every design requirement could be traced back to either literature (Phase 1), empirical data (Phase 2), or theory (DCT). This "design-trace" approach ensures the artefact's dependability by providing a transparent audit trail of how decisions were made.

10.2.4 Phase 4 (Delphi Study): Expert Verification and Validation

Information Contribution: The Delphi study provided expert consensus on the model's usability, clarity, and relevance.

Building the Model: Feedback from Round 1 led to simplifying maturity levels and adding a practical banking use case to enhance the model's applicability.

Rigour in Decision-Making: To ensure the results were not influenced by social pressure (groupthink), the study utilised participant anonymity and controlled feedback loops. The consensus threshold was defined *a priori* as $\geq 80\%$ agreement on Likert-scale items, providing a standardised, objective indicator of quality.

10.2.5 Summary of Qualitative Rigour Applied

To support the overall quality of the integration process, the following measures were implemented in accordance with Guba and Lincoln's (1994) framework:

- **Credibility (Truth-Value):** Achieved through crystallisation, combining four complementary data lenses (scoping review, interviews, Delphi, and reflexive memos) to ensure a well-rounded view.
- **Dependability (Consistency):** Ensured via a transparent audit trail and reflexive journaling, allowing external reviewers to track the logic and decision rules applied at every stage of the study.

- Confirmability (Neutrality): Maintained through member checking, where participants reviewed interview transcripts and model iterations to verify that the final artefact accurately reflected their operational reality.
- Transferability: Supported by providing a "thick description" of the South African banking context and the specific organisational structure of the case bank, allowing readers to assess the model's applicability to other settings.

10.3 How to use the CII Model Integration Model

This model can be used in different departments of a banking organisation. However, there are internal prerequisites that must be met before the model is applied.

1. The user must have received the relevant CI and Innovations methodology training, depending on their role and the Maturity level. Appropriate training is required to understand and follow the various methodologies, including Lean, Six Sigma, Design Thinking, and TRIZ/ARIZ. Competence in applying these methodologies will be developed through practical projects and, therefore, learning by doing. The explanations of the different role players are set out in section 10.5.3 of the document below, which was distributed to the participants.
2. The model can be applied to service projects.

Once an organisation has met the prerequisite training, it will first determine the current maturity level of the organisation/business unit, which defines the level of growth and exposure the company has regarding processes and Innovation Thinking. Level 1 represents a low maturity, while Level 4 represents a high maturity. A maturity level is not implemented in isolation but includes all the preceding maturity levels. For example, if a company is at maturity level 3, it means it has already implemented levels 1 and 2 and will implement level 3 alongside them. It is not a one-off implementation, but rather an ongoing process. The following steps would have been applied per maturity level:

Maturity level 1: All employees to have received basic Lean Six Sigma training (Typically the white and Yellow belt level), as suggested by participants during the interviews. The employees will have followed the training in a phased approach, starting with the "Define" Step of Six Sigma and the "Plan" step of Lean, which is part of Phase 1. Thereafter, during Phase 3, the employees will receive training on the "Measure, Analyse, Improve and Control" steps of Six Sigma and the "Do & Check" steps of Lean. Basic Creativity of Innovations will be encouraged during Phase 3 as well. The employees will complete the "Act" Step from the Lean Methodology, covered during Phase 4. Basic customer focus is covered through all phases. The Specialised roles will follow

the same phases, but with more advanced training levels, for example, the Green and Belt levels of the Lean Six Sigma Methodology.

Maturity level 2: Continuous improvement awareness (Lean Six Sigma) has been identified as the foundation of the integration model, as indicated by the scoping review and participant interviews, which encompassed both basic and specialised training. Therefore, after Lean Six Sigma training, all employees will receive Innovations training, including Design Thinking methodology. The employees will start with Phase 1, which consists of the “Empathise, define, and Ideate” steps for Design Thinking. Thereafter, moving to Phase 3 for the Prototype and Test steps. As Design Thinking emphasises customer focus, it will be covered in greater depth than during maturity level 1.

Maturity level 3: This level will include the Support Team, consisting of Innovation and Process Representatives who have both completed Maturity Levels 1 and 2 training. The Support team will start at Phase 2, which involves implementing an Internal project and Solutions Library concept under the TRIZ/ARIZ methodology for Innovations. Thereafter, the support team will move to Phase 4 for standardisation and sustainability of the library.

Maturity level 4: This level will be followed by the Research team, which consists of employees researching possible solutions from external companies for a similar internal project problem. The Research team will start in Phase 2, which involves implementing an external project and a solutions Library concept under the TRIZ/ARIZ methodology for Innovation. Thereafter, the research team will move to Phase 4 for Standardisation and Sustainability of the external Library.

The process steps will then be followed for the corresponding maturity swim lane. Starting from the first phase through to phase 4. The Role players responsible for the swimlane are indicated in the model. After reaching the respective maturity level, the company will continue to build on the existing maturity levels.

In Round 2 of the Delphi technique, the refined model was shared, and participants reached consensus. The final model is presented below. The refined model is presented in this thesis document for ease of reading.

10.4 CII Integration Model

Achieving a sustainable competitive advantage in the highly information-intensive South African banking sector requires integrating CI and innovative behaviours at every stage of the bank’s activities (Ahinful et al., 2024; Porter, 1985). Companies must continually strive to improve their competitiveness to survive and thrive in today's global economy. Companies cannot be successful if they do not actively concentrate on applying both Continuous Improvement and

Innovation Thinking. By integrating these methodologies, companies can maintain a competitive edge in their respective industries.

This integrated model will help organisations better understand Innovation Thinking and CI methodologies, and how to integrate both effectively. The CII Integration Model below includes methodologies, phases, role players, and the organisation's maturity level. The model outlines key methodologies, implementation phases, role players, and organisational maturity levels, offering a roadmap for sustainable innovation and operational excellence.

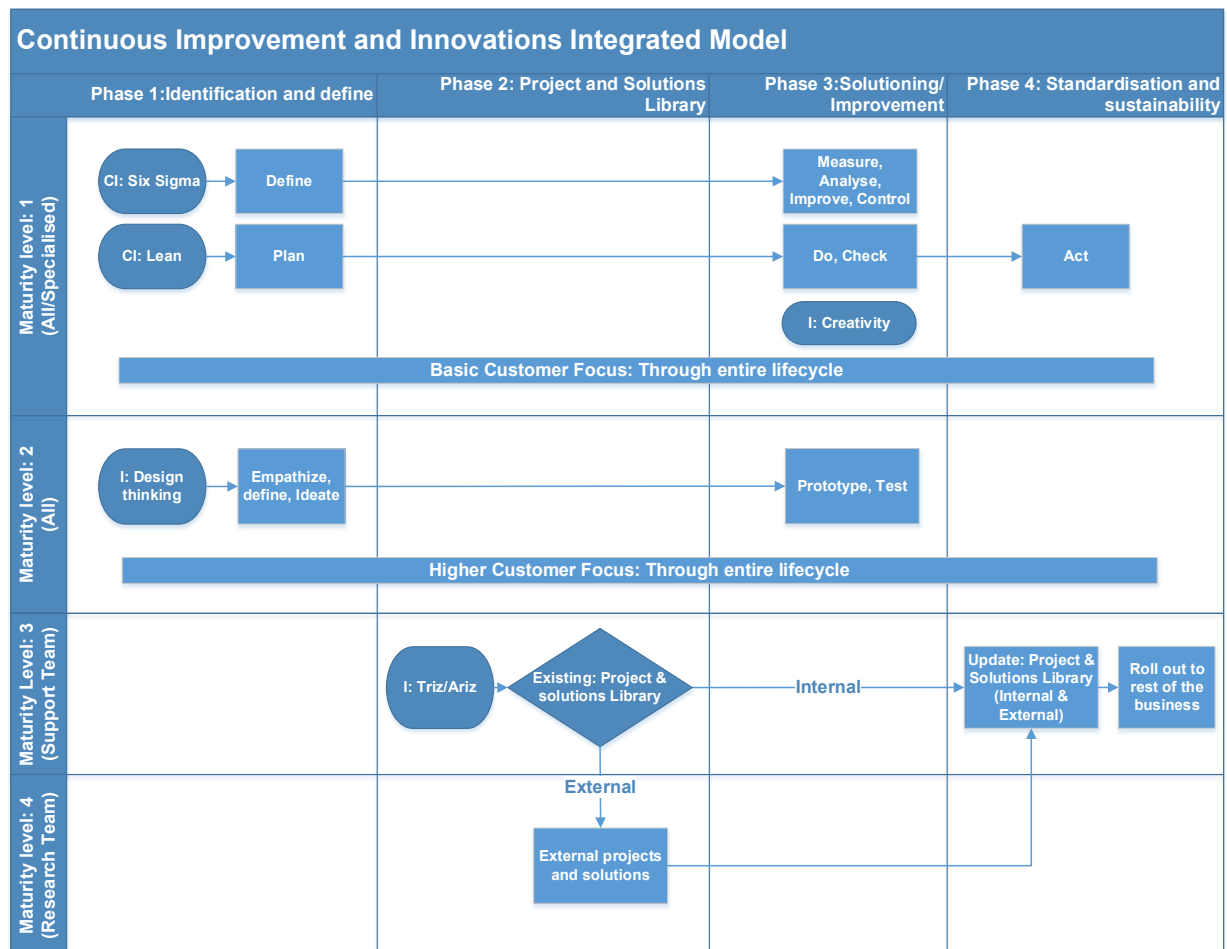


Figure 10-2: CII Integration Model

Figure 10-2 presents an integrated model of continuous improvement and innovation to assist organisations in integrating methodologies and ways of thinking. To implement the model, organisations first need to understand the methodologies of continuous improvement and Innovation Thinking.

10.4.1 Theoretical Architecture

10.4.1.1 Dynamic Capabilities and Horizons

To ensure theoretical rigour and address participant recommendations, the CII model is built on a fundamental distinction between two types of organisational capabilities (Helfat & Winter, 2011; Teece, 2025):

Operational Capabilities (H1 Focus): These capabilities represent the "ordinary capabilities" or static routines required for the bank to make a living by running and incrementally improving current services (Teece, 2014; 2025; Winter, 2003). CI methodologies (including Lean, Six Sigma, TQM, and TPM) reside primarily here to stabilise, standardise, and optimise existing processes (Richards & Coetzee, 2026a).

Dynamic Capabilities (H2–H3 Focus): These are higher-order capabilities that enable the bank to sense environmental shifts, seize emerging opportunities, and reconfigure its operating model (Teece, 2007, 2025). Discovery-driven innovation resides here, allowing the organisation to adapt to new technologies, regulations, or Fintech competitors (Ahinful et al., 2024; Teece, 2025).

Innovation Thinking methodologies (e.g., Design Thinking, TRIZ/ARIZ) are positioned as supporting routines. They act as the bridge that translates a "sensed" problem into a viable "seized" solution direction (Kurtmollaiev et al., 2018; Soares & Navas, 2023).

The orchestration of these capabilities is mapped across the Three Horizons of Innovation to prevent "Horizon 1 entrapment," in which an overfocus on current efficiency leads to long-term obsolescence (Penker et al., 2018). The table below illustrates how each horizon is linked to the types of organisational capabilities, the CI or Innovation Thinking methodologies, and the objective of each horizon.

Table 10-2: Mapping Theoretical Perspectives

Horizon	Capability Focus	Methodology	Strategic Objective
Horizon 1 (H1)	Operational (Ordinary)	CI: Lean, Six Sigma, TQM, TPM, 8D	Exploitation: Optimising current banking routines (March, 1991).
Horizon 2 (H2)	Dynamic (Higher-order)	Supporting: Design Thinking, Agile	Expansion: Sensing and seizing creative improvements (Penker et al., 2018).
Horizon 3 (H3)	Dynamic (Higher-order)	Radical: Discovery R&D, Tech Scopes	Exploration: Reconfiguring assets for breakthroughs (March, 1991; Teece, 2025).

10.4.1.2 Diagnostic Mapping via Porter's Value Chain

The CII Integration Model also applies Porter's Value Chain. In Phase 1, Porter's (1985) Value Chain provides a disaggregated view of the bank. This allows the bank to move from "invisible" individualised processes to a visible state in which functional quality gaps (i.e., the difference between *what* service is provided and *how* it is delivered) are identified (Zhuo, 2019). Following the Value Chain, the Primary Activities (e.g., Operations and Service) are the targets for CI/Operational capabilities to eliminate waste and reduce variance (Porter, 1985; Richards & Coetzee, 2026b). The Support Activities (e.g., Technology Development and HR) are the targets for Dynamic capabilities to reconfigure internal and external assets (Teece, 2025).

The CII Integration Model identifies where failures in support activities (e.g., outdated IT infrastructure) create bottlenecks in primary activities (e.g., customer onboarding), allowing the Support Team to find cross-functional solutions (Porter, 1985). This allows for the linkages between projects.

The model requires a "middle-up-down" management model in which middle managers (Support Team) bridge visionary, top-down strategy and frontline operational realities (Nonaka, 1988).

Boundary Conditions for Application:

Operational/CI Approach: Applies when the problem is well-defined, uncertainty is low, and the goal is to optimise existing routines (Teece, 2025).

Dynamic/Discovery Approach: Applies when facing "wicked problems," high market turbulence, or a need for radical business model reconfiguration (Teece, 2025).

Incentives and Governance: The bank must move beyond purely technical productivity metrics to reward Innovative Behaviour (INB) and the realisation of value within Horizons 2 and 3 (Ahinful et al., 2024; ISO 56002:2019).

10.4.1.3 CII Integration Model integration with ISO Standards

ISO 9001:2015 comparison with the CII Integration Model

Although the CII Integration Model was not built with ISO standards in mind, it integrates with ISO standards primarily by leveraging the process approach and PDCA cycle required by ISO 9001:2015. The CII Integration Model is built upon Lean and Six Sigma methodologies, which were identified as the most frequently used frameworks in the banking industry during the Scoping review in Chapter 5. These methodologies utilise structured frameworks such as DMAIC and PDCA, which align with ISO 9001:2015's requirement that organisations employ a process

approach to manage their systems (Teeling et al., 2023; Soares & Navas, 2023). The model aligns with core quality principles specified in ISO 9001:2015, such as customer focus, leadership, and improvement. Furthermore, it addresses the ISO requirement for system improvement by providing a formal framework that sequences operational excellence and creativity to drive sustainable growth (Yasar et al., 2019).

A critical objective of ISO 9001:2015 is to standardise processes to deliver quality products and services consistently (ISO, 2015). The CII Integration model supports this through Phase 4: Standardisation and Sustainability, which focuses on rolling out optimised processes and updating a centralised solutions library. This centralised library is designed to prevent project duplication and maintain documented information, meeting a key requirement for managing organisational knowledge under the ISO standard.

ISO 9001:2015 applies a framework intended to improve alignment and integration among management systems (ISO, 2015). The CII Integration model leverages this flexibility by providing a maturity-based scaling path that enables organisations to adopt integrated improvement and innovation processes progressively, aligned with their existing infrastructure. This phased adoption enables organisations to maintain a competitive edge while fulfilling the ISO mandate for sustainable development and strategic performance improvement.

ISO 56002:2019: Innovation comparison with the CII Integration Model

The CII Integration Model integrates with international standards, specifically ISO 56002:2019, by providing a practical, methodologically grounded framework that operationalises the high-level guidance found in the ISO standard.

Both ISO 56002:2019 and the new CII Integration Model utilise the PDCA cycle as their foundational engine for continuous improvement. ISO 56002:2019 organises its clauses (4-10) around the PDCA cycle to manage innovation capabilities and evaluate performance. The new model identifies PDCA as a core component of the Lean methodology, using it as a foundation for building integrated improvement and innovation tasks.

While ISO 56002:2019 provides generic guidance applicable to any organisation, the new model offers a specific roadmap for service-based sectors, such as banking, by bridging the gap between established standards and practical tools. The ISO standard notes that management system standards complement each other and can be implemented together. The new model builds on this by integrating Lean Six Sigma with Innovation Thinking methodologies such as Design Thinking and TRIZ.

The phases of the new model directly mirror the operational guidance for innovation initiatives outlined in Clause 8.3 of ISO 56002:2019.

Phase 1 (Identification and Define): Aligns with the ISO standard's focus on identifying opportunities.

Phase 2 (Project and Solutions Library): Supports the ISO objective of exploiting insights and knowledge to reduce uncertainty.

Phase 3 (Solutioning/Improvement): Integrates the ISO steps for concept creation, validation, and solution development.

Phase 4 (Standardisation & Sustainability): Aligns with the deployment of solutions and monitoring impact.

Both the ISO standard and the new model identify leadership commitment and a supportive culture as the foundational pillars for success. The model provides specific role definitions from general employees to specialised Research Teams to fulfil the leadership and support requirements specified in the standard.

10.4.1.4 CI Body of Knowledge (BOK)

Organisations could explore the CI Body of Knowledge (BOK), e.g., the 20 Keys, to measure their maturity or readiness by the depth of their practices in future research. The CI BOK is defined as an integration of organisational philosophy, techniques, and structures intended to achieve sustained performance improvements in all activities on an uninterrupted basis (Erceg et al., 2018). The 20 Keys methodology is an integrated system based on the Toyota Production System (Kobayashi, 1995) that uses 20 specific tools to evaluate organisational performance and provide a path toward excellence through benchmarking and a structured rating system (Erceg et al., 2018). The system measures maturity by utilising simple evaluation schemes and steps to gradually increase ratings across all 20 business areas, typically moving from lower to higher levels of performance (Erceg et al., 2018). The 20 Keys methodology is fundamentally designed for manufacturing environments, having originated as the "Practical Program of Revolutions in Factories" (Kobayashi, 1995). While some proponents suggest it can be adapted for services, its core tools remain focused on factory-floor processes such as coupled manufacturing and machinery maintenance (Gider, 2004; Erceg et al., 2018). Utilising such a production-centric system to build an integrated model risks neglecting the intangible value creation and the high degree of human interaction inherent in service sectors such as banking (Antony et al., 2019; Velu, 2021). There is also a notable lack of empirical research documenting the actual influence of the 20 Keys methodology on global market competitiveness (Dabić et al., 2016).

The evolutionary maturity levels can also be explored, as defined by the BOK, which categorises the evolution of CI behaviour within an organisation through a six-stage model (Erceg et al., 2018). Organisations should also explore technologies or platforms that better support their maturity levels, e.g., TRACC, which was not included in the current study.

10.4.2 Overview of Methodologies Used in the Integrated Model

10.4.2.1 Continuous Improvement

The model integrates two of the most widely used process improvement methodologies:

Six Sigma and Lean.

Six Sigma: A data-driven approach that reduces variation and improves quality. It follows five key steps (DMAIC):

- **Define:** The project charter clearly outlines the problem and its objective statement. The team members, scope, and timelines need to be selected. The 'as is' financials and budget are agreed on. During this stage, the critical-to-quality (CTQ) and cost-to-quality (COQ) are defined and measured. The "Voice of the Customer" (VOC) is also defined.
- **Measure:** The measure phase involves gathering 'as is' through measurement system analysis of the metrics defined during the Define phase. Your team and management need to determine the targets for each metric. The project scope is mapped during this stage. Another popular tool used during this stage is the SIPOC, which indicates the Supplier, Input, Process, Output, and Customer of the process.
- **Analyse:** The data collected during the Measure phase needs to be analysed using graphical analysis. The team needs to brainstorm causes for the problem using root cause analysis tools, such as the Fishbone diagram. The Fishbone diagram, also known as the Cause-and-Effect Diagram, helps the team identify all possible causes of the problem. Root causes need to be determined by data analysis and tools, such as 5 Whys and cause-and-effect matrices. The 5 Whys is a root cause analysis tool that asks the question 'why' multiple times until the root cause is determined. The cause-and-effect matrix assists in measuring to determine root causes. Process performance needs to be measured against targets agreed upon in earlier stages. Systematic tools, such as Design of Experiments (DOE), are used to study the relationships among multiple variables and key outputs. Solutions for the root causes need to be implemented through pilot programs.
- **Control** is the final phase in the Six Sigma DMAIC approach. The last phase is to ensure the improved process remains under control through statistical process control (SPC). SPC is the application of a few statistical methods that monitor the process. The desired process results

are monitored to ensure the process remains under control, and preventive measures are implemented. A handover plan needs to be followed. Control plans, audits and handover plans are all part of the control phase.

Lean: Focuses on improving flow and eliminating waste (non-value-adding activities). It follows the PDCA cycle:

- Plan: Identify and analyse the problem
- Do: Developing and testing the potential improvements
- Check: Measuring and testing the solution's effectiveness. Analysing further improvements.
- Act: Solution implementation and full rollout.

Lean Six Sigma: A Combination of the DMAIC and PDCA steps.

Together, Lean and Lean Six Sigma provide a structured approach to improving processes, making them faster, more efficient, and more reliable.

10.4.2.2 Innovation Methodologies

To support creative problem-solving and innovation, the model incorporates the most commonly adopted and effective tools:

Design Thinking: A customer-focused process that emphasises empathy and collaboration. It includes:

- Empathise: Conduct research to develop an understanding of your customers.
- Define: Combine the research and define the customer problems.
- Ideate: According to the problem defined, identify a suitable solution for the customer.
- Prototype: A design that visualises the solution required by the customer.

Test: Meet customer satisfaction with the prototype that is a stable development.

TRIZ/ARIZ: A structured innovation approach based on patterns of problem solving. It helps find breakthrough ideas by matching known problems and solutions to new challenges.

Creativity: Encourages original thinking and spontaneous idea generation. It supports unconventional approaches and promotes a culture of innovation.

These methods are summarised in Figure 10-3 below:

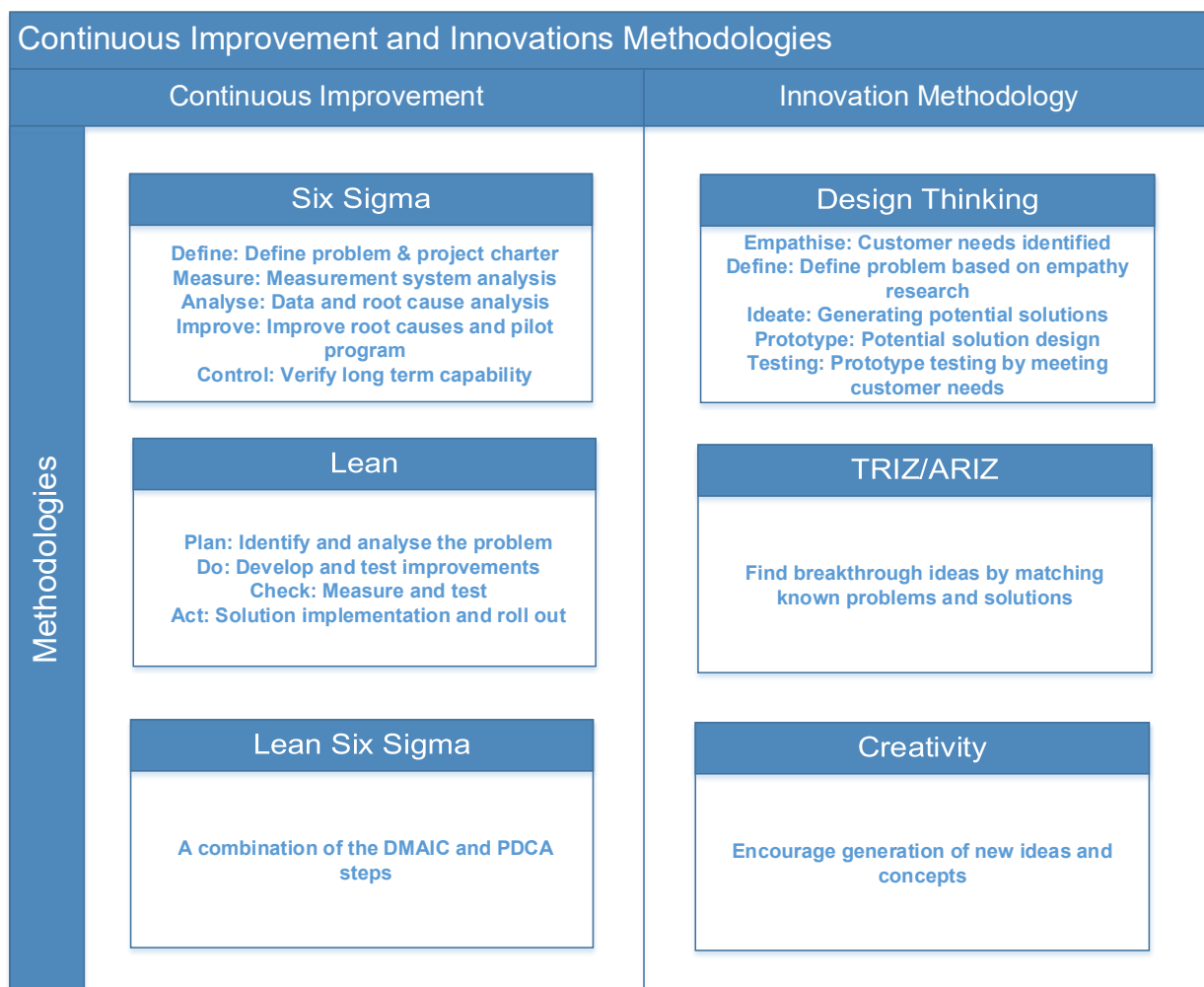


Figure 10-3: Overview of methodologies

10.4.3 Why These Methodologies?

While there are many other models (e.g., 8D, TQM, CASM, Action Research, SEWBOK), the selection of these methodologies was based on:

Frequency of use within the banking sector

Awareness of methods within the organisation

Proven success in implementation

Alignment with both continuous improvement and innovation goals

This integrated model draws on both structured process improvement and creative problem-solving to drive meaningful, sustainable change.

10.4.4 Role-players

The integrated model has the following role-players. The roles of players differ by maturity level and phase, as indicated in Figure 6-1. The model defines specific role-players to manage the tension between efficiency and creativity (Tushman & O'Reilly, 1996):

All: This includes all employees in the organisation. All employees should receive basic continuous improvement awareness and problem-solving training, as outlined in the white and yellow belts.

Specialised professionals: The more advanced level of continuous improvement, Green & Black belt (Lean Six Sigma), should be considered specialised skills.

Support team: The support team consists of Innovation and Process Representatives. Both are highly skilled in their roles, with comparable levels of skill and practical experience. The team has bridging roles, using Design Thinking and TRIZ to seize sensed opportunities and update the Project & Solutions Library (Altshuller, 1999; Vetterli et al., 2016).

Research team: The research team consists of employees who research possible solutions from external companies for a similar internal project problem. This team has a dedicated function tasked with Horizon 3 transforming capabilities by exploring external novelty and breakthroughs to prevent internal duplication (Teece, 2025).

The model consists of 4 phases. These phases are summarised in Figure 10-4 below:

Continuous Improvement and Innovations Integrated Model				
	Phase 1	Phase 2	Phase 3	Phase 4
Phase summary	Project Identification and define	Project and Solutions Library	Solutioning/Improvement	Standardisation and sustainability
	Clearly defined problem and project 'as is' status as well as a clear understanding of the customer needs and expectations	Project and solutions library with existing projects and solutions. This includes internal and external projects and solutions.	Improved, tested and creative solution for the problem identified during phase 1, according to customer needs and expectations	New optimised process rollout to the rest of the business to drive standardisation. Update project and solutions library

Figure 10-4: Overview of new integrated model phases

10.4.4.1 Phase 1: Project Identification and Definition

Phase 1 encompasses the Define phase from the Six Sigma methodology (CI), the Plan phase from the Lean methodology (CI), and the Empathise, Define, and Ideate phases from the Design Thinking methodology (Innovations). A strong focus on the customer is already included in phase 1, which is covered under the CI methodologies, but is expanded in depth through the addition of

the Design thinking methodology. Phase 1 applies to all company employees, typically those at the White and Yellow Belt levels, covering awareness and basic problem-solving for Continuous Improvement methodologies. Green and Black Belt, which are more advanced problem-solving levels, should be covered by more specialised process practitioners.

The outcome of phase 1 is a clearly defined problem, the project's 'as-is' status, and a clear understanding of customer needs and expectations.

10.4.4.2 Phase 2: Project & Solutions Library

Phase 2 covers the TRIZ/ARIZ (Innovation) thinking by developing a Project and solutions library with existing projects and solutions. The support team needs to assist library employees in determining whether their project has already been implemented across the broader organisation. This will prevent the duplication of projects and employee effort. This will also drive standardisation in the organisation.

The company also needs to be aware of external solutions with similar internal problems. The research team is responsible for researching alternative solutions from external companies.

The outcome of phase 2 is to determine whether the project identified during phase 1 is not an existing project that has been completed within the organisation or externally. If yes, the support team can assist the employee in contacting the relevant internal stakeholders, prevent duplication, and drive standardisation. If the solution is external, then the research team will assist the employee.

10.4.4.3 Phase 3: Solutioning/Improvement

Phase 3 includes the Measure, Analyse, Improve, and Control of the Six Sigma Methodology (CI) and the Do, Check from the Lean Methodology (CI). It also includes the Prototype and Test from the Design Thinking Methodology (I). Creativity from the Innovations methodology is also included during this phase. Although there is no formal methodology for Creativity, the company needs to encourage creative solutions during this stage.

The outcome of Phase 3 is an improved and tested solution for the problem defined during Phase 1, tailored to meet the customer's needs and expectations.

10.4.4.4 Phase 4: Standardisation and sustainability

Phase 4 covers the Act of Lean (CI), which refers to continuous improvement and rollout. After a project has been completed, the business needs to focus on the next improvement and solution rollout into the rest of the business. This phase also covers the TRIZ/ARIZ methodology

(Innovations) to update the existing Project and solutions library with newly implemented projects, preventing duplication for the business. After a process has been optimised or after new designs and improvements have been made, the solution needs to be rolled out to the rest of the business to drive standardisation.

The outcome of Phase 4 is an updated library with the latest project solutions for the rest of the business and projects implemented, rolled out to the rest of the organisation to drive standardisation.

The CII Integration Model follows a workflow to ensure the realisation of value from new or changed entities (ISO 56000:2020):

- **Phase 1: Project Identification and Definition:** Uses Value Chain analysis and Design Thinking to capture the "Voice of the Customer" (Porter, 1985; Vetterli et al., 2016).
- **Phase 2: Project & Solutions Library:** A searchable database that prevents "Horizon 1" duplication by matching problems to existing solutions (Stein & Zwass, 1995).
- **Phase 3: Solutioning and Improvement:** Combines CI loops (DMAIC/PDCA) with Innovation prototyping and testing (Gu et al., 2021; Soares & Navas, 2023).
- **Phase 4: Standardisation and Sustainability:** Focuses on rolling out solutions horizontally across supply chain partners and vertically across internal business units (Gökalp et al., 2021).

10.4.5 Maturity Level of Organisation

The maturity level of an organisation refers to the level of growth and exposure the company has regarding processes and Innovation Thinking.

Level 1 is beginner-level, and Level 4 is the advanced maturity level in Continuous Improvement and Innovation Thinking.

10.4.5.1 Maturity Level 1

This level includes the CI methodologies of Six Sigma (DMAIC) and Lean (PDCA) or/and the combined Lean Six Sigma. A company at maturity level 1 should start with Continuous Improvement as the basis for its CI and Innovation journey and build from a strong CI foundation. The CI methodology already includes built-in high-level Customer needs identification.

Although there are no formal methodology steps and guidelines for Creativity (I), the company must encourage creative solutions and out-of-the-box thinking.

10.4.5.2 Maturity Level 2

After a company has reached a strong maturity level 1, it can build its level 2 maturity by increasing its customer focus to a higher level covered during level 1 to all employees. Higher customer focus should be built throughout the project lifecycle through the Innovation methodology design thinking, which includes Empathy, definition, ideation, prototyping, and testing.

10.4.5.3 Maturity Level 3

After a company has reached mature levels 1 and 2, it should focus on level 3 by introducing the concept of the Innovation methodology TRIZ/ARIZ during phases 2 and 4. This is done by building a library of existing CI and Innovations projects and solutions for the company. The support team needs to be familiar with the project library and the relevant stakeholders to assist employees with their projects and company networking. This will help employees avoid reinventing the wheel and eliminate project duplication for the company. The library needs to be updated at stage 4 after the new projects have been implemented to make sure that the library is up to date with the latest completed internal projects and solutions. The Innovation methodology, Creativity should also be encouraged during phase 3 for project solutions. Although there are no formal methodology steps and guidelines for Creativity (I), the company must encourage creative solutions and out-of-the-box thinking.

10.4.5.4 Maturity Level 4

After a company has reached mature levels 1-3, it can focus on level 4 maturity. At Level 4, the Research team is primarily responsible for exploring potential project solutions externally for projects identified during Phase 2. The library needs to be updated at stage 4 after the new projects have been implemented to ensure that it is up to date with the latest completed projects and solutions.

These maturity levels are summarised in Figure 10-5 below:

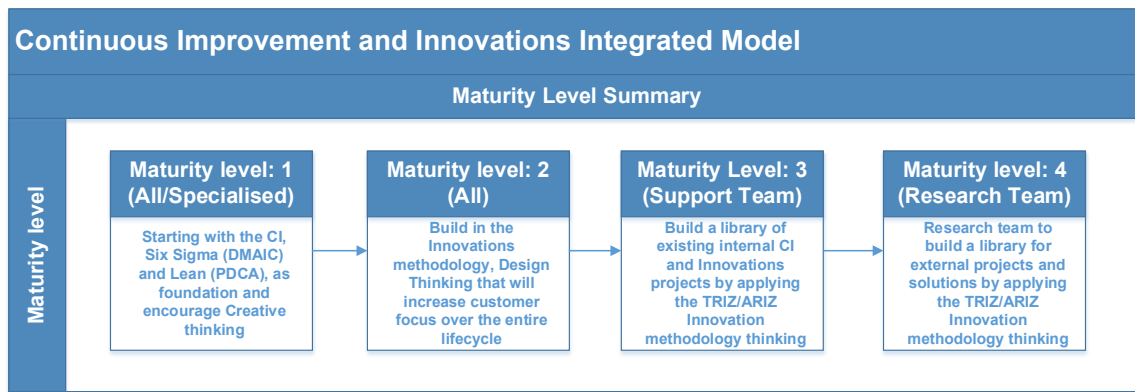


Figure 10-5: Overview of Maturity levels

This model frames Maturity Levels (1–4) as a validated measurement roadmap for capability development (Paulk et al., 1993). This staged approach allows a bank to evolve from basic operational routines to higher-order transforming capabilities (Borch & Madsen, 2007).

10.4.6 Implementation Challenges & How to Overcome Them

Several possible challenges have been identified during the interviews and Delphi feedback rounds that need to be addressed when implementing the proposed integration model. The section below highlights the challenges and possible solutions offered during these interviews. Notably, there are other ways to address these challenges, and these should be investigated in future studies.

10.4.6.1 Change Management Challenge:

Resistance to change is one of the most common barriers to implementing a new integrated model or strategy. Employees may feel overwhelmed by new processes or fear taking on additional responsibilities. Management may not fully understand the value of integrating CI and Innovation, leading to a lack of visible support.

How to Overcome:

Leadership Commitment: Get buy-in from top management early. Senior leaders should actively champion the model.

Clear Communication: Develop a compelling narrative that explains why this integration is essential and how it benefits individuals and teams.

Appoint Change Agents: Assign change managers or CI/Innovation ambassadors in each department to guide implementation and maintain momentum.

Training & Awareness: To raise awareness, begin with White and Yellow Belt training, then scale up specialist capabilities (Green and Black Belts).

Quick Wins: Showcase early success stories to build trust and enthusiasm.

10.4.6.2 Project & Solution Library Maintenance Challenge:

If not properly managed, the library can quickly become outdated or underutilised. Staff may not be aware of its existence or how to utilise it. Identifying solution duplications also requires expert knowledge.

How to Overcome:

Ownership Structure: Assign dedicated ownership to the Support Team for library governance and updates.

Centralised Platform: Use an accessible and searchable digital tool

Regular Updates: Incorporate library review as a mandatory part of project closure (Phase 4).

User Training: Provide orientation and templates for documenting and retrieving project data.

Validation Process: Involve process experts to review and tag entries for relevance and duplication prevention.

10.4.6.3 Resource Allocation & Expertise Challenge:

Phases 1 and 2 may generate a high volume of improvement ideas and project requests, but without sufficient people or skills to execute them in later phases, efforts can stall. Additionally, CI and Innovation efforts should be deliberate, and the allocation of resources and change management should be formally addressed.

How to Overcome:

Resource Forecasting: Anticipate CI/Innovation workloads and budget for complete lifecycle support (not just idea generation).

Dedicated Time: Allocate specific time in employee KPIs for innovation/CI activities, especially for support and research teams.

Skills Mapping: Identify skills gaps and build a pipeline of Green and Black Belts and innovation specialists.

Cross-functional Teams: Encourage collaboration across departments to distribute workload and promote shared ownership.

10.4.6.4 Organisational Silos Challenge:

Departments often work in silos, making it difficult to share learnings, coordinate solutions, or standardise improvements across the organisation.

How to Overcome:

Integration Forums: Host regular cross-departmental CI/Innovation sessions to share learnings, updates, and challenges.

Cross-Pollination Projects: Assign team members from different departments to collaborate on initiatives.

Leadership Reporting: Include inter-department collaboration KPIs in performance reviews of senior managers.

10.4.6.5 Innovation Fatigue / Idea Overload Challenge:

If employees are constantly encouraged to ideate without structured follow-through, engagement may decline due to the perception of inefficiency or wasted effort.

How to Overcome:

Feedback Loop: Ensure employees receive feedback on their submissions, even if ideas are not implemented.

Recognition: Celebrate contributions through visible rewards, spotlight stories, or recognition in team meetings.

10.4.6.6 Sustaining Momentum Challenge:

Initial enthusiasm may fade over time, especially without ongoing support, recognition, and results.

How to Overcome:

Phase 4 Emphasis: Treat standardisation and sustainability as a key goal, not just project completion.

Continuous Measurement: Track KPIs on adoption and project success rates.

Culture Integration: Align CI and Innovation values with the organisation's mission, performance reviews, and development paths.

10.4.7 Model Example: Use Case: Improving Customer Onboarding in a Bank

Context

A bank's Retail Division receives repeated customer complaints about the slow onboarding process for new account openings. On average, it takes 12 business days, resulting in customer dissatisfaction and lost leads.

Applying the CII Integration Model

Phase 1: Project Identification and Define Problem

Six Sigma (Define): The team defines the problem: "Customer onboarding is taking too long and resulting in poor customer experience."

Lean (Plan): Define the problem and map out the current ("As-Is") onboarding process using a value stream map.

Design Thinking (Empathise, Define, Ideate): Interviews with customers reveal frustrations around paperwork and unclear status updates. Develop personas and create customer journey mapping.

Outcome: A well-defined problem and a clear understanding of the customer's pain points.

Phase 2: Project & Solution Library

TRIZ/ARIZ: The support team searches the internal project library to check if any similar solutions exist in other.

Research Team: Investigate external competitors who struggle with a similar problem or have an improved solution.

Outcome: Identifies an existing internal or external solution that can be adopted. Avoids duplicating work.

Phase 3: Solutioning / Improvement

Six Sigma (Measure, Analyse, Improve): Teams complete necessary data collection, analyse the data to determine root causes of the problem and implement an improved solution against the target.

Lean (Prototype, Test): Build a prototype and test the desired results against the target.

Design Thinking (Prototype, Test): Develops a prototype of a simplified and quicker process and tests according to the target.

Creativity: Team hosts a brainstorming session with frontline staff to generate fresh ideas for better communication and reduced timelines during onboarding.

Outcome: A redesigned, tested onboarding process with a reduced onboarding time according to the target, meeting customer requirements.

Phase 4: Standardisation and Sustainability

Lean (Act): Implements the improved process across all branches.

TRIZ/ARIZ: Adds this project and solution to the Project and Solution Library for future reference.

Outcome: The bank achieves consistency in onboarding across regions, improves customer satisfaction, and achieves a 30% cost reduction in processing.

Maturity Level Reflection

Level 1: The team used Lean and Six Sigma to define and solve the problem.

Level 2: Applied Design Thinking for customer-centricity.

Level 3: Utilised TRIZ/ARIZ to prevent duplication and build standardisation.

Level 4: The research team explored external solutions and enriched the solution library.

CHAPTER 11 VALIDATION (EVALUATION) OF THE RESEARCH PROCESS

11.1 Chapter Orientation

The research document is organised into 12 chapters and four sections. Figure 11-1 shows where the current chapter fits within the overall structure of the report.

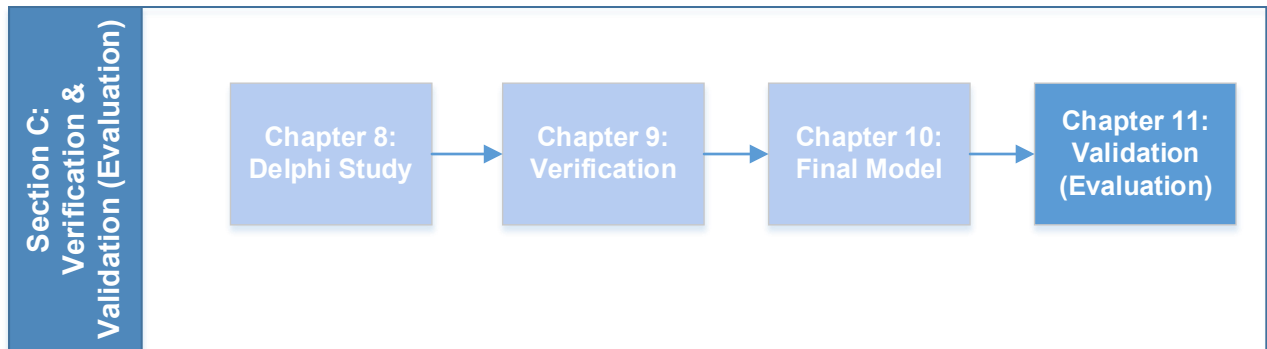


Figure 11-1: Position of Chapter 11 in the Report Structure

This chapter aligns the research process and its outcomes, confirming the study's quality, credibility, and contribution. While Chapter 8 focused on expert confirmation of the CII Integration Model, Chapter 9 verified the model's alignment with design requirements. This chapter validates (evaluates) the research as a whole, its theoretical grounding, methodological rigour, and alignment with its stated aims and objectives.

This chapter represents Phase 4 (Holistic Validation) of the entire research process. It contributes to the project in several ways:

It aligns the research outcomes with the core objectives and the Dynamic Capabilities theoretical lens.

It confirms the study's Trustworthiness through Credibility, Transferability, Dependability, and Confirmability.

It documents the audit trail and independent co-coding processes that ensured researcher neutrality.

It provides "thick description" to support the transferability of findings to other service industries. The insights gained in this chapter confirm that the research process was logically structured and methodologically rigorous. It is important to note that a thick description of the South African Banking industry is provided to protect the intellectual property of the case study bank.

The study was framed by Dynamic Capabilities Theory (DCT) (See Section 3.4), which provided a conceptual lens for understanding how organisations sense, seize, and reconfigure capabilities in dynamic environments. Validation in this chapter reflects on how the research process was aligned with this theoretical foundation and how the outcomes contribute to knowledge and practice.

11.2 Alignment of the Research Problem and Theoretical Lens

The research addressed a clearly defined and relevant problem: the lack of integration between CI and Innovation Thinking in the South African banking sector. This issue affects organisational responsiveness, innovation effectiveness, and process efficiency.

11.2.1 Relevance of the Problem

The scoping review research paper (Chapter 4) confirmed that integrated models bridging CI and innovation are scarce in the literature, particularly in service contexts such as banking, and more specifically in South Africa.

Further, findings from the Interviews (Chapter 5) revealed operational fragmentation, role confusion, and missed opportunities for innovation, despite the existence of CI structures.

11.2.2 Theoretical Lens: Dynamic Capabilities Theory

The research process was validated through the lens of DCT (Chapters 3 and 6), which served as the foundational scaffold for integrating CI and Innovation Thinking (Teece et al., 1997; Teece, 2018). The model was developed based on the scoping review (Chapter 4), interviews (Chapter 5), and verified and validated (evaluated) via the Delphi method and theory (Chapters 8, 9 and 11). As part of the development process, and keeping with the traditions of the dynamic capabilities theory, the model has to address certain key activities (Chapter 6):

Applying this model, employees should be able to:

1. Identify and understand opportunities and challenges in the environment
2. Mobilise resources and take action to capitalise on the opportunities
3. Reconfigure or adapt resource application or operational conditions to maintain a competitive edge.

While the study initially viewed CI and Innovations Thinking methodologies as a singular integrated toolkit, the validation phase (Phase 4) refined the model by explicitly distinguishing

between different classes of organisational capabilities to provide greater strategic depth (Teece, 2025).

To achieve sustainable competitive advantage and contextual ambidexterity, the model is built on an analytical split into two distinct classes of organisational capabilities.

The Operational-Dynamic Split across Three Horizons

The organisation must simultaneously manage different temporal demands by mapping its capabilities across the Three Horizons of Innovation (Helfat, & Winter, 2011; Penker, 2018).

Horizon 1 (Operational Capabilities): This horizon focuses on exploitation and "making a living" through ordinary capabilities. Here, CI methodologies (such as Lean, Six Sigma, TQM, and TPM) are utilised to stabilise, standardise, and incrementally improve banking operations.

Horizons 2 and 3 (Dynamic Capabilities): These horizons focus on exploration and "ongoing organisational renewal". Higher-order dynamic capabilities allow the bank to sense environmental shifts (such as Fintech disruption), seize emerging opportunities, and reconfigure its operating model for long-term sustainability.

Innovation Thinking as the Bridging Mechanism

Within this integrated structure, Innovation Thinking methods (such as Design Thinking, TRIZ/ARIZ, and sustainability tools) are reframed from primary sources of radical discovery into supporting routines. These methods act as critical "bridging functions" or translation tools within the dynamic capability cycle (Kurtmollaiev et al., 2018). Specifically, they enable the Seizing meta-capability by providing the systematic logic required to turn a sensed opportunity or a technical contradiction into a validated, implementable solution.

Strategic Alignment and Synergistic Integration

By integrating these points, the model ensures that CI and Innovation are not treated as opposing paradigms, but as complementary logics that occur in parallel. This architecture prevents "Horizon 1 entrapment", where excessive focus on short-term efficiency leads to long-term obsolescence, by ensuring that operational routines provide the stability necessary to fund and support future-driven discovery work.

Additionally, participants indicated that the model needed to include common challenges and address them to ensure alignment with the stated goals and to integrate CI and IT to maintain a competitive advantage.

In essence, dynamic capabilities theory provided the framework for understanding how this bank can achieve and sustain competitive advantage amid constant change by developing the ability to adapt, innovate, and renew its resources and capabilities within the bounds of the suggested model.

The research problem and theoretical lens were therefore valid, timely, and relevant to organisational and academic audiences.

11.3 Assessment of Research Design and Methodological Rigour

The study followed a multi-phase, qualitative case study design with a logical progression from problem diagnosis to model development and refinement. The research consisted of the following phases:

Phase 1 involved a scoping review of the global literature on CI and innovation integration.

Phase 2 consisted of Semi-structured interviews with practitioners at a South African bank.

Phase 3 involved a model design based on a literature review and empirical synthesis.

Phase 4 included an expert validation through a Delphi study and checklist verification.

The Methodological Integrity was proven through the following:

In Phase 1, the scoping review followed the PRISMA-ScR principles. The scoping review confirmed and defined the knowledge gap, for example, the lack of integration between CI and Innovation Thinking methodologies. Therefore, a need was identified for further research to integrate continuous improvement and Innovation Thinking, specifically at a methodological level, in the banking sector of South Africa (Richards and Coetzee, 2026a).

In Phase 2, the interview data were thematically analysed using ATLAS.ti with co-coding for reliability. The interview data identified the root causes for not combining CI and Innovation Thinking, and an empirical investigation was conducted to explore how CI and Innovation Thinking could be integrated in the specific case study. In Phase 3, the learning was used to build the new integrated model.

In Phase 4, the Delphi process provided structured feedback and iterative refinement. The Delphi technique was used to verify and validate (evaluate) the new integrated model. The purpose of the Delphi was to determine whether there was consensus regarding the new integrated model. Ethical standards, including consent and confidentiality, were upheld. The trustworthiness criteria applied in this study are presented in Section 11.6 below.

A limitation of this study is the inherent 'breadth vs depth' trade-off, where extensive contextual investment in a single bank was prioritised to facilitate deep insights (Szajnfarber & Gralla, 2017). This enhances credibility (internal validity) by exploring complex organisational behaviour in its natural setting (Lincoln & Guba, 1985). To mitigate researcher bias, the study employed crystallisation and viewed findings through four distinct data lenses: a scoping review, interviews, Delphi rounds, and reflexive memos (Tracy, 2010). This triangulation ensures the results reflect a believable reality (Ahmed, 2024; Fusch & Ness, 2015).

In conclusion, the research process was logically structured, transparently documented, and methodologically rigorous.

11.4 Evidence of Objective Fulfilment

The research was guided by four core objectives, each of which was fully addressed. These are presented in the table below.

Table 11-1: Evidence of Objective Fulfilment

Research Objective	Achieved Through
Phase 1: Identify and compare CI and innovation methodologies	Scoping review (Chapter 4)
Phase 2: Explore root cause analysis & integration challenges, as well as the organisational context.	Interview analysis (Chapter 5)
Phase 3: Develop an integrated model (Artefact Design)	Synthesis and model design (Chapters 6,7, and 10)
Phase 4: Verification & Validation (Evaluation) of the model.	Delphi study & Design trace review (Chapters 8, 9, and 11)

The outcomes were aligned with the original intent and contributed to solving the stated research problem (Chapter 1).

Conclusion: The study fulfilled all stated objectives and generated meaningful outcomes.

11.5 Trustworthiness Criteria and Validation (Evaluation)

In line with Guba and Lincoln's (1994) four-part framework and following Mayan's (2009) call for methodological coherence, credibility, transferability, dependability, and confirmability, these qualities were intentionally built into every phase of the study to ensure its quality. Table 11-1 summarises the criteria, guiding principles, and concrete techniques. In this section, the criteria will be aligned with the processes followed in the study.

11.5.1 Credibility

Credibility addresses the extent to which the findings constitute a trustworthy representation of the data collection and analysis processes (Guba & Lincoln, 1994). Credibility was established through triangulation (crystallisation) between data sources, co-coding, and member checking (Tracy, 2010). In this study, four complementary strategies were employed:

1. Crystallisation across four data lenses (scoping review, semi-structured interviews, Delphi rounds, reflexive memos) ensured corroboration of the findings from different angles;
2. An independent interviewer was present during all interviews and analysed transcripts in ATLAS.ti alongside the primary researcher. Additionally, the qualitative co-coder ensured that bias was limited and that the data were interpreted in line with the research questions by independently coding sections of the data, taking part in inter-coder reliability checks and consensus discussions (Frieze, Soratto, & Pires, 2018).
3. Member checking allowed participants to verify both transcript accuracy and preliminary interpretations. The Delphi panel reviewed and revised the model across two rounds.
4. Peer review through the submission of Phases 1 and 2 articles to accredited journals.

Further, the adequacy of the sample size was supported by achieving data saturation, the point at which further coding yielded no new information (Naeem et al., 2024). Specifically, the (n+1)th interview produced no additional themes compared to the (n)th interview, confirming informational redundancy (Fusch & Ness, 2015). This procedure demonstrates credibility, as the data set was fully explored until the research objectives were satisfied (Lincoln & Guba, 1985).

While the researcher acknowledges the potential for anchoring and priming bias inherent in validating (evaluating) a structured model through the Delphi technique (Chapter 8), several steps were taken to mitigate these risks. Crucially, the 'anchor' (the conceptual model) was not researcher-imposed; rather, it was built using a bottom-up approach, in which the methodologies and the Solutions Library concept emerged directly from participants' open-ended interview responses in Phase 2. The use of independent co-coding and member checking ensured that the Delphi rounds served to verify a participant-driven artefact, maintaining the credibility and neutrality of the findings. Additionally, the Delphi rounds included both open-ended and closed-ended responses to allow participants to share their perspectives or suggestions around the methodologies that should be included in the final model.

Evidence. Inter-coder reliability logs and consensus notes are included in the electronic audit trail. Second, the anonymised Delphi responses are also included in the audit trail. Additionally,

the model refinement is presented in Chapter 10. Finally, no participant requested substantive changes after the second round of the Delphi method, indicating that the interpretations were acceptable to those who provided the data.

11.5.2 Transferability

Transferability concerns whether sufficient contextual detail is provided for readers to evaluate the applicability of findings to their own settings (Tracy, 2023). This study ensured transferability through thick description and conceptual coherence.

Conceptual coherence refers to the interconnection of literature and theories applied in the study, encompassing the research question, design, method, data analysis procedures, and interpretation of findings (Mayan, 2009; Tracy, 2010). In this study, the Dynamic Capabilities Theory, research questions, methods, and analysis remained tightly aligned, while Chapters 4–7 furnish detailed portraits of the focal bank's structure, CI maturity, and innovation challenges.

Additionally, two qualitative data-gathering methods (Scoping Review and interviews) were used to provide rich, detailed descriptions of the application of continuous improvement and innovation in a South African context, specifically in the bank.

Evidence: Transferability was used through a thick description of context and findings. The findings were discussed in different chapters in this study. Detailed descriptions of the organisation and industry were provided, and the model was developed within this context. Chapters 4-7 provide detailed information about the integration of CI and Innovation Thinking in South Africa and in this case study organisation. The final model presented in Chapter 10 provides detailed information on when and how it can be applied.

11.5.3 Dependability

Dependability refers to the logical, traceable, and documented nature of the research process. The use of audit trails and systematic documentation ensured dependability and confirmability (Finlay, 2006). A comprehensive audit trail (Finlay, 2006) was kept from the proposal stage through final analysis, containing ethics approvals, recruitment logs, version-controlled ATLAS.ti project files, coding memos, and Delphi revision records. Reflexive memos captured the researchers' evolving assumptions and decisions.

Evidence: The audit trail is stored on a labelled USB drive (see Chapter 3). An external research consultant reviewed the whole trail and concluded that all analytic steps could be followed from raw data to the final theme map; the audit letter is reproduced in Appendix G.

11.5.4 Confirmability

Confirmability tests whether findings flow from the data rather than from researcher bias. It is underpinned by the same audit trail and by systematic reflexive journaling. To ensure confirmability, interpretations and model refinements were returned to participants for member checking (Lincoln & Guba, 1985). This verification process ensures that the viewpoints and experiences of the banking experts are accurately represented, confirming that the results are grounded in participant data rather than the researcher's imagination (Ahmed, 2024). After each interview and coding session, the lead researcher documented positionality reflections and discussed potential biases in peer debriefs with the co-coder.

Evidence: The audit trail contains reflective notes that show how initial thoughts were captured, assumptions were surfaced, and assumptions were bracketed. Additionally, the coding process is also included in ATLAS.ti project bundles and Excel analysis files, demonstrating that conclusions derive directly from empirical evidence.

Collectively, the measures outlined above establish that the study is credible, transferable, dependable, and confirmable. This foundation of qualitative rigour underwrites the objective-fulfilment analysis in Section 11.6 and the contribution claims set out in Section 11.7.

11.6 Conclusion

This chapter confirmed the trustworthiness of the research process and outcomes based on relevance, rigour, and contribution. Guided by Dynamic Capabilities Theory and employing a robust qualitative case study approach, the study addressed an underexplored issue in banking innovation and improvement strategies in South Africa.

Having completed both verification and validation (evaluation), the model is now ready for implementation and dissemination, as discussed in the final chapters. The next chapter concludes the thesis by highlighting key insights and outlining opportunities for future application and research.

CHAPTER 12 CONCLUSION AND RECOMMENDATIONS

12.1 Chapter Orientation

This Chapter is the final chapter of Section D. Figure 12-1 indicates the position of the current chapter within the bigger report structure.

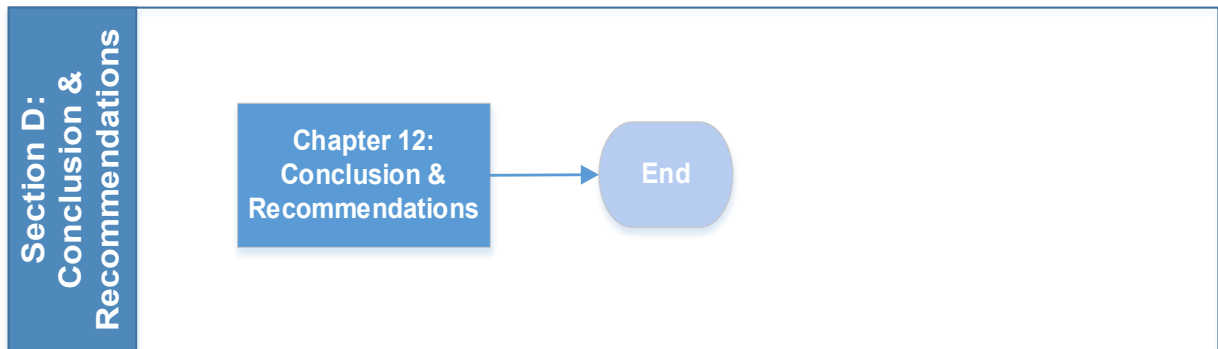


Figure 12-1: Report Structure: Conclusion & Recommendations

This final chapter provides the synthesis and recommendations for the entire research project. It contributes to the project in several ways:

It summarises the theoretical, methodological, and practical contributions to the field of Industrial Engineering.

It provides strategic recommendations for banking leadership to adopt a top-down approach to integration.

It outlines a roadmap for future research, including digital enablers like Artificial Intelligence and Machine Learning.

It reflects on the study's success in bridging the identified knowledge gap within South African banking. This chapter synthesises the entire DSR cycle into a coherent set of actionable insights for academia and industry.

12.2 Introduction

CI and Innovations are well-known and strong problem-solving methodologies, but they are usually implemented separately and in isolation. Companies tend to focus on short-term, quick wins because they are less risky and yield results in a shorter period (see Chapter 1). It has been identified that both CI and Innovation Thinking must be integrated and implemented simultaneously for companies to remain competitive, enabling smaller, continuous, and radical

innovations (see Chapter 5). Both approaches are necessary for achieving short-term and long-term competitive sustainability and maintaining ongoing customer satisfaction. Although the need has been clearly defined, previous research has shown that there is a lack of research on how CI and Innovation methodologies can be effectively integrated, specifically for the banking industry in South Africa.

Therefore, the research problem identified was that CI and Innovation methodologies were not well integrated in the banking industry in South Africa, which is necessary for companies to remain competitive. The aim was to develop an integrated model for Continuous Improvement and Innovation Thinking.

The chapters and contributions of the current study are summarised below.

12.3 Summary of the Research Process

The research report has been broken down into four (4) sections: Contextualization, Empirical Research, Verification & Validation (Evaluation), and Conclusions & Recommendations. A summary of these sections is provided below.

Section A: Contextualisation

The introduction and background were covered in **Chapter One**. The chapter contextualised the problem statement and linked it to the identified gap. The current study aimed to develop an artefact that encourages the integration of continuous improvement and Innovation Thinking methodologies for banking in South Africa.

Chapter Two provided an overview of the frequently used and applied CI and innovation methodologies, discussing each method in depth.

Chapter Three presented the research design and methodology adopted to achieve the study's objectives. The chapter outlined the research paradigm, design rationale, multi-phase approach, data collection strategies, data analysis methods, and ethical considerations.

Section B: Empirical Research

Chapter Four consisted of a scoping review that was required to gain in-depth access to the existing literature and to identify the gap required to build an integrated model for CI and Innovation Thinking. The scoping review provided a solid literature basis for the development of the integrated model.

Chapter Five aimed to determine the root causes of not combining CI and Innovation Thinking through interviews and conducted an empirical investigation on how CI and Innovation Thinking

could be integrated for the specific case study. The findings of this chapter and the lessons learned from Chapter 4 were used to develop design requirements and build an integrated model for CI and Innovation Thinking.

Chapter Six presented the design requirements derived from the preceding research phases. The functional, contextual, methodological, process, system, infrastructure, and traceability requirements have been clearly defined.

The conceptual model integrating CI and Innovation Thinking has been developed according to the design requirements and learnings from the literature study, scoping review, and interviews. The conceptual model was presented in **Chapter Seven**.

Section C: Verification & Validation (Evaluation)

The Delphi method was used to assess consensus on the conceptual model, which is covered in **Chapter Eight**. The Delphi study successfully validated (evaluated) the CI Innovation Integrated Model (CII Model). Expert consensus was achieved on all core dimensions, and the iterative feedback significantly enhanced model clarity, relevance, and usability.

Chapter Nine covered the Research Verification process. This chapter verified that the CII Integration Model adheres to the design requirements and confirmed that the new integrated model satisfies them.

The CII Integration Model was developed based on the findings of the literature, scoping review, and interviews, which were verified and validated. The CII Integration Model was unpacked in **Chapter Ten**.

The validity (evaluation) of the research process and outcomes based on relevance, rigour, and contribution was confirmed in **Chapter Eleven**. Therefore, the research demonstrated trustworthiness and relevance.

Section D: Conclusion & Recommendations

Chapter Twelve concludes the research with a summary and offers recommendations and research ideas for the future.

12.4 Key Findings, Contributions, and Implications

This study made theoretical, methodological, and practical contributions to the fields of industrial engineering and banking, as explained below.

12.4.1 Theoretical Contributions

The study advanced the application of Dynamic Capabilities Theory (see Chapter 6) in the banking sector by framing CI and innovation as complementary dynamic capabilities, rather than independent, and outlined the corresponding methodologies.

The study also mapped out the overlap between CI and Innovation methodologies, a gap previously unaddressed in research. As indicated in the scoping review, very few scholars have integrated these methodologies in the manufacturing industry, and there are no studies to date that indicate this overlap in the services industry. This current study is the first of its kind in the South African banking industry.

Second, a conceptual model was developed based on a scoping review of research and interviews with employees familiar with continuous improvement and Innovation Thinking. The model was developed into a practical tool for use in the banking industry. There are currently limited studies that integrate CI and Innovation Thinking. This study not only identified the overlap between the two approaches but also pinpointed where integration could occur and provided a theoretical and practical model to test and apply in future research.

The CII Integration Model proposed a phased, role-based approach that connects operational and strategic improvement logics in the banking industry.

12.4.2 Methodological Contributions

The CII Integration Model employed a phased approach to model development, utilising qualitative case study methods tailored to the maturity level of each area. Transparent methodologies were employed, with clear steps outlined in the model, highlighting the overlap between the various methodologies.

Insufficient research has been conducted to date on the integration of Continuous Improvement and Innovation Thinking. Previous research indicated that the methodologies should be combined, but did not specify how to integrate them. The study also bridged the gap between CI and Innovation by mapping the overlap between their methodologies, a gap not addressed in previous research.

The CII Integration Model developed for the bank in South Africa can serve as a basis for replication and further development in different industries and countries. The CII Integration Model presents a practical example of theory-informed model building. Future research opportunities are outlined in Section 11.5.3.

The study integrated literature synthesis, fieldwork, and expert review into a coherent research pathway for combining CI and Innovation Thinking.

12.4.3 Practical Contributions

The study developed a usable model grounded in the real needs of practitioners in the banking industry. This was achieved through collaboration with employees to develop a practical model that could be implemented on their projects.

The CII Integration Model clarified role responsibilities, maturity levels, and project structuring for integrated improvement.

The CII Integration Model will serve as a roadmap to help banks and leadership align and integrate continuous improvement and innovation, without implementing either approach in silos or in isolation. The banks can leverage the combined benefits of both methodologies to drive simultaneous small, continuous, and radical improvements. The CII Integration Model will offer a structured, phased approach tailored to the maturity level of each area, along with clearly defined methodologies and roles.

The CII Integration Model will maximise the benefits of both methodologies while complementing both approaches to reach their full potential. The integrated model will also prevent companies from selecting only one methodology, which is insufficient for both short-term and long-term growth and profitability. This will help gain momentum in both approaches, leading to a competitive advantage and ultimately better financial results. The model will enhance strategic agility through the integration of structured innovation. The study developed a usable model grounded in the real needs of practitioners in the banking industry.

Leadership will need to drive the approach strategically and allow for sufficient change management for employees to buy in and support the new integrated model. The employees need to receive the necessary training, and upskilling will be required for the new roles. The employees KPI's and performance development plans will need to be aligned with the new roles and responsibilities.

The new integrated model produced tools (e.g., project libraries) to support sustainable implementation, as well as challenges identified with proposed solutions on how to overcome these challenges.

Therefore, in conclusion, the study makes original contributions across theoretical, methodological, and practical domains.

12.5 Recommendations

12.5.1 Implementation Recommendations

There are several recommendations that companies need to follow for a successful adoption of the CII Integration Model.

It is recommended that the CII Model implementation start with pilot teams in medium-maturity business units to gather learnings that will benefit both low- and high-maturity business units.

Second, the model needs to be embedded into existing CI and innovation reporting structures. The roles can then be further developed from the existing structure.

The model needs to follow a top-down approach, with management strategically driving and supporting the new CII Integration model. The required change management programs also need to be in place. The benefits must also be clearly communicated to all employees by management.

The employees also need role orientation support and awareness.

12.5.2 Policy and Practice

The company needs to align KPIs and performance management with the newly identified roles.

The required budget must be available to fund and support cross-role training aligned with maturity growth. Sufficient time must also be provided to employees to attend the training and development programs for the new roles.

Sufficient time and resources must be allocated to build the project library and meet the research team's requirements.

12.5.3 Limitations and Future Research

This study was limited to a single South African bank, limiting the generalisability of the findings to other sectors or countries. A recognised limitation of this case study is the inherent 'breadth vs depth' trade-off, where extensive contextual investment in a single banking institution was chosen to facilitate nuanced insights (Szajnfarder & Gralla, 2017). While this limits nomothetic generalisability, it strengthens credibility (truth-value) and provides the thick descriptions necessary for readers to assess the transferability of findings to similar organisational settings (Ahmed, 2024). Future research should investigate the integration of services across various industries and countries.

The study also employed a qualitative approach. Future research could include a quantitative study and the development of an integration model to assess organisational readiness.

The CII Integration model was validated by CI and Innovation experts, but has not yet been fully implemented in organisational practice. The CII Integration model should also be tested after implementation.

The maturity framework is limited, and further study and refinement are needed in future research. Future research could also explore other fields and digital enablers, such as Artificial Intelligence, Machine learning, Robotic Process Automation or Agile.

Organisations could explore the CI Body of Knowledge (BOK), e.g., the 20 Keys, to measure their maturity or readiness by the depth of their practices in future research.

12.6 Final Reflections

This research makes it clear that CI and Innovation Thinking are both required for companies to remain competitive and achieve sustainable growth. This research has proven that it does not have to be an isolated approach, and that CI and Innovation Thinking can support each other and be integrated.

The CII Integration Model is not a one-size-fits-all, quick-fix approach. It is dependent on the organisation's maturity level and should be implemented in a phased approach with well-defined roles and responsibilities. Top management support is crucial for the successful implementation of the model. The structured approach can unlock cultural change and strategic transformation.

The CII Integration model effectively addressed the identified gap of a lack of a transparent, integrated approach to Continuous Improvement and Innovation Thinking at a methodological level within the banking industry in South Africa. The model should be an evolving approach, tested and implemented in other industries and countries. Through these learnings, it should be further developed into an ultimate, integrated model for Continuous Improvement and Innovation across all industries worldwide.

The research made it clear that the CII Integration model is needed for a company's competitive advantage. By using the CII Integration model, the company can fully utilise both CI and Innovation Thinking at a methodological level to innovate and improve business processes, thereby increasing customer satisfaction and company profitability.

REFERENCES

- Abdallah, A.B., Dahiyat, S.E. & Matsui, Y. 2019. Lean management and innovation performance. *Management Research Review*, 42(2):239-262.
- Abernathy, W.J. and Clark, K.B. 1985. Innovation: mapping the winds of creative destruction. *Research Policy*, 14, pp. 3-22.
- Abu Baker, F.A., Subari, K. & Daril, M.A.M. 2015. Critical success factors of Lean Six Sigma deployment: A current review. *International Journal of Lean Six Sigma*, 6(4):339–348.
- Agyabeng-Mensah, Y., Ahenkorah, E., Afum, E. and Owusu, D. 2020. The influence of lean management and environmental practices on relative competitive quality advantage and performance. *Journal of Manufacturing Technology Management*, 31.
- Ahinful, A.A., Opoku Mensah, A., Koomson, S., Cobblah, C., Takyi, G. & Kwarteng, A.H. 2024. Achieving banking industry innovation performance using total quality management: An empirical study. *The TQM Journal*, 37(5):1292-1319
- Ahmed, S.K., 2024. *The pillars of trustworthiness in qualitative research*. Journal of medicine, surgery, and public health, 2, p.100051.
- Amaro, P.A., Alves, A.C. & Silva e Sousa, R.M.A. 2020. The Integration of Lean Thinking Principles in the Organizational Culture Model. *Organizational Cultures*, 24(1): 1-29. doi:10.18848/2327-8013/CGP/v24i01/1-2
- Anand, G. & Kodali, R. 2010. Analysis of lean manufacturing frameworks. *Journal of Advanced Manufacturing Systems*, 9(1):1–30.
- Andriopoulos, C. & Lewis, M.W. 2009. Exploitation–Exploration Tensions and Organizational Ambidexterity: Managing Paradoxes of Innovation. *Organization Science*, 20, pp. 696–717.
- Antony, J., Sunder M, V., Sreedharan, R., Chakraborty, A. and Gunasekaran, A., 2019. A systematic review of Lean in healthcare: a global prospective. *International Journal of Quality & Reliability Management*, 36(8), pp.1370-1391.
- Anvari, M. & Anvari, A. 2022. Innovation realisation with the support of TQM practices: A perspective from Iran's tire industry. *Proceedings on Engineering Sciences*, (5)1:1-14.
- Arksey, H. & O'Malley, L. 2005. Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1): 19–32.
- Berrington, S., 2025. Digital adoption in Banking | The next wave of transformation in South Africa. *EY / Calleo Solutions*.
- Beyhan Yasar, N., Sezen, B. and Karakadilar, I.S., 2019. *Mediating effect of continuous improvement on the relationship between innovation and financial performance*. Total Quality Management & Business Excellence, 30(7-8), pp.893-907.

- Bhuiyan, N., Baghel, A. & Wilson, J. 2006. A sustainable continuous improvement methodology at an aerospace. *International Journal of Productivity and Performance Management*, 55(8):671–687.
- Bleady, A., Ali, A.H. & Ibrahim, S.B. 2018. Dynamic capabilities theory: Pinning down a shifting concept. *Academy of Accounting and Financial Studies Journal*, 22(2):1–16.
- Boavida, R., Navas, H., Godina, R., Carvalho, H. & Hasegawa, H. 2020. A combined use of TRIZ methodology and the eco-compass tool as a sustainable innovation model. *Applied Sciences*, 10(10):3535.
- Boer, H. and Gertsen, F., 2003. From continuous improvement to continuous innovation: a (retro)(per) spective. *International Journal of Technology Management*, 26(8), pp.805-827.
- Bonaccorsi, A., Carmignani, G. & Zammori, F. 2011. Service Value Stream Management (SVSM): Developing Lean Thinking in the Service Industry. *Journal of Service Science and Management*, 4(4): 428-439. doi: 10.4236/jssm.2011.44048
- Braun, V., Clarke, V. and Hayfield, N., 2022. 'A starting point for your journey, not a map': Nikki Hayfield in conversation with Virginia Braun and Victoria Clarke about thematic analysis. *Qualitative research in psychology*, 19(2), pp.424-445.
- Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M. & Süßbauer, E. 2019. Design thinking for sustainability: Why and how design thinking can foster sustainability-oriented innovation development. *Journal of Cleaner Production*, 231: 1248-1257.
- Coetzee, R. 2019. Development of the Respect for People model for lean implementation in the South African context. Potchefstroom: North-West University. (Thesis – PhD).
- Creswell, J.W. & Poth, C.N. 2018. Qualitative inquiry and research design: Choosing among five approaches. Thousand Oaks, CA: Sage.
- Creswell, J.W. 2013. *Qualitative inquiry and research design: Choosing among five approaches*. 3rd ed. Thousand Oaks, CA: Sage.
- Daudt, H.M.L., Van Mossel, C. & Scott, S.J. 2013. Enhancing the scoping study methodology: A large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology*, 13:48.
- Dieffenbacher, S.F., Hüttinger, C., Zaninelli, S.M., Lines, D. and Rein, A., 2024. *How to Create Innovation: The Ultimate Guide to Proven Strategies and Business Models to Drive Innovation and Digital Transformation*. John Wiley & Sons.
- Eisenhardt, K.M. 1989. Building theories from case study research. *The Academy of Management Review*, 14(4): 532–550.

- Elangovan, S., Jusoh, M.S., Yusuf, D.M., Ismail, M.S. & Din, M.H. 2021. 8D problem solving methodology: Continuous improvement in automation organization. *Journal of Physics: Conference Series*, 2129(1): 012017.
- Enworo, O.C., 2023. *Application of Guba and Lincoln's parallel criteria to assess trustworthiness of qualitative research on indigenous social protection systems*. *Qualitative research journal*, 23(4), pp.372-384.
- Finlay, L. 2006. 'Rigour', 'ethical integrity' or 'artistry'? Reflexively reviewing criteria for evaluating qualitative research. *The British Journal of Occupational Therapy*, 69(7):319–326.
- Fiorillo, A., Sorrentino, A., Scala, A., Abbate, V. & Dell'Aversana Orabona, G. 2021. Improving performance of the hospitalization process by applying the principles of lean thinking. *The TQM Journal*, 33(7): 253-271.
- Friese, S., Soratto, J. & Pires, D. 2018. *Carrying out a computer-aided thematic content analysis with ATLAS.ti*. MMG Working Paper 18-02. ISSN 2192-2357
- Fusch, Patricia I. Ph.D. and Ness, Lawrence R., "Are We There Yet? Data Saturation in Qualitative Research" (2015). Walden Faculty and Staff Publications. 455. <https://scholarworks.waldenu.edu/facpubs/455>
- Gao, S. & Low, S.P., 2014. The Toyota Way model: an alternative framework for lean construction. *Total Quality Management & Business Excellence*, 25(5-6):664-682.
- Gentles, S.J., Charles, C., Ploeg, J. & McKibbin, K.A. 2015. *Sampling in qualitative research: Insights from an overview of the methods literature*. *The Qualitative Report*, 20(11): 1772–1789.
- Gough, D., Thomas, J. and Oliver, S., 2012. *Clarifying differences between review designs and methods*. *Systematic reviews*, 1(1), p.28.
- Guba, E.G. and Lincoln, Y.S., 1994. *Competing paradigms in qualitative research*. *Handbook of qualitative research*, 2(163-194), p.105.
- Guest, G., Bunce, A. and Johnson, L., 2006. *How many interviews are enough? An experiment with data saturation and variability*. *Field methods*, 18(1), pp.59-82.
- Hancock, D.R., Algozzine, B. and Lim, J.H., 2021. *Doing case study research: A practical guide for beginning researchers*.
- Hartono, M., Setijadi, S. & Norwandi, L. 2019. A conceptual integrative model of Kansei Engineering, Kano and TRIZ towards sustainability in services. *Journal of Advanced Research in Dynamical and Control Systems*, 11(5):385-390.
- Henrique, D.B. and Godinho Filho, M., 2020. *A systematic literature review of empirical research in Lean and Six Sigma in healthcare*. *Total Quality Management & Business Excellence*, 31(3-4), pp.429-449.

- Hevner, A.R., March, S.T., Park, J. & Ram, S. 2004. Design science in information systems research. *MIS Quarterly*, 28(1):75–105.
- ISO (2019). *ISO 56002:2019 Innovation management — Innovation management system — Guidance*. Geneva: International Organization for Standardization.
- Khan, S.A., Kaviani, M.A.J., Galli, B. and Ishtiaq, P. (2019), “*Application of continuous improvement techniques to improve organisation performance: a case study*”, *International Journal of Lean Six Sigma*, Vol. 10 No. 2, pp. 542-565.
- Krafcik, J.F. 1988. Triumph of the lean production system. *MIT Sloan Management Review*, 30(1):41–52.
- Krefting, L. 1991. Rigor in qualitative research: The assessment of trustworthiness. *The American Journal of Occupational Therapy*, 54(3):214–222.
- Lazo-Amado, M. & Andrade-Arenas, L. 2023. Designing a mobile application for children with dyslexia in primary education using augmented reality. *International Journal of Interactive Mobile Technologies*, 17(2):76.
- Leeds-Hurwitz, W. 2015. Thick description. *The International Encyclopaedia of Language and Social Interaction*, 1–5.
- Leite Estanislau do Amaral, L.F., 2020. *Innovation and economic growth in two perspectives: Social capital and social protection policies* (Doctoral dissertation, University of Illinois at Urbana-Champaign).
- Levac, D., Colquhoun, H. & O'Brien, K.K. 2010. Scoping studies: Advancing the methodology. *Implementation Science*, 5(1): 69.
- Lewis, G.K., Williams, B., Allen, S., Goldfarb, B., Lyall, K., Kling, R. & Statham, P. 2021. Developing an evaluation tool to provide a 360-degree reflection on work-integrated learning in accounting education. *Accounting Education*, 30(6): 601-620.
- Li, Z., Atherton, M. & Harrison, D. 2014. Identifying patent conflicts: TRIZ-led patent mapping. *World Patent Information*, 39:11–23.
- Lincoln, Y. S., & Guba, E. G. 1985. *Naturalistic inquiry*. Beverly Hills, CA: Sage .
- Lizarelli, F.L., de Toledo, J.C. & Alliprandini, D.H. 2021. Relationship between continuous improvement and innovation performance: An empirical study in Brazilian manufacturing companies. *Total Quality Management & Business Excellence*, 32(9-10): 981-1004.
- Lizarelli, F.L., Toledo, J.C.D., Gambi, L.D.N. & Gonçalves, C.L. 2023. Continuous improvement behaviors and impacts on innovation. *The TQM Journal*, 35(2): 366-388.
- Makhaya, T. and Nhundu, N., 2016. Competition, Barriers to Entry and Inclusive Growth in Retail Banking: Capitec Case Study. *The African Journal of Information and Communication (AJIC)*, 17, pp.111-137

- March, J.G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), pp. 71-87.
- Martin, R., 2010. Design thinking: achieving insights via the “knowledge funnel”. *Strategy & Leadership*, 38(2), pp.37-41.
- Mayan, M.J. 2009. Essentials of qualitative inquiry. Walnut Creek, CA: Left Coast Press.
- McKim, C. 2023. Meaningful member-checking: A structured approach to member-checking. *American Journal of Qualitative Research*, 7(2):41–52.
- Mendoza-Arviso, U. & Solís-Rodríguez, F.T. 2022. Quality, knowledge, and innovation of manufacturing processes in Ciudad Juárez, Mexico. *Retos, Revista de Ciencias Administrativas y Económicas*, 12(23):1-12.
- Mncanca, L., 2025. Banking on change. *Case Writing Centre, University of Cape Town*.
- Mohaghegh, M., Blasi, S. & Groessler, A. 2021. Investigating the relationship between lean management practices, dynamic capabilities and sustainable business performance. *Journal of Cleaner Production*, 322: 129073.
- Moher, D., Liberati, A., Tetzlaff, J. and Altman, D.G., 2009. *Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement*. Bmj, 339.
- Mondato, 2023. South Africa: A Model Of Stability Or Stymied Innovation?.
- Mondato, 2023. South Africa: A Model Of Stability Or Stymied Innovation?. Accessed from: <https://blog.mondato.com/south-africa-spotlight/>
- Mothibi, K. and Rahulani, A., 2021. Digital banking trends in South Africa. *Financial Sector Conduct Authority, South Africa*.
- Mottaghi, M., Shirvani, A. and Dalvi, M.R., 2022. *Organizational ambidexterity model for digital innovation in the banking industry*. International Journal of Digital Content Management, 3(4), pp.153-175.
- Mousavi, S.F., Azar, A., & Khodadad, S.H. 2021. Success factors of innovation management in the banking industry using the grounded theory approach. *Journal of Industrial Engineering and Management Studies*, 8(2):138–159.
- Moussa, F.Z.B., De Guio, R., Dubois, S., Rasovska, I. & Benmoussa, R. 2019. Study of an innovative method based on complementarity between ARIZ, lean management, and discrete event simulation for solving warehousing problems. *Computers & Industrial Engineering*, 132:124-140.
- Moyo, A., 2026. AI reshapes South African banks’ investment priorities. *ITWeb*

- Muriithi, R.G. 2014. *Continuous improvement approaches and performance of operations among commercial banks in Kenya*. Nairobi: University of Nairobi. (Thesis – PhD).
- Naeem, M., Ozuem, W., Howell, K. and Ranfagni, S., 2024. *Demystification and actualisation of data saturation in qualitative research through thematic analysis*. *International Journal of Qualitative Methods*, 23, p.16094069241229777.
- Ngo, N.D.K., Le, T.Q., Tansuchat, R., Nguyen-Mau, T. and Huynh, V.N., 2022. *Evaluating innovation capability in banking under uncertainty*. *IEEE transactions on engineering management*, 71, pp.855-872.
- Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J., 2017. *Thematic analysis: Striving to meet the trustworthiness criteria*. *International journal of qualitative methods*, 16(1), p.1609406917733847.
- Ohno, T. 1988. *Toyota Production System: Beyond Large-Scale Production*. 1st ed. New York: Productivity Press.
- Otieno, A.A. 2016. *Continuous improvement practices and efficiency of commercial banks in Kenya*. Nairobi: University of Nairobi. (Thesis – PhD).
- Penker, M., Junermark, P. & Jacobson, S. 2017. *How to assess and measure business innovation thinking*. San Bernardino, CA: Innovation 360.
- Penker, M., Junermark, P. & Jacobson, S. 2018. *Sustainable growth and profits*. San Bernardino, CA: Innovation 360.
- Porter, M.E. 1985. *Competitive Strategy: Creating and Sustaining Superior Performance*. New York: Free Press.
- Posada, M., Tamayo, M., Carmona, C., Osorio, B., Marulanda, C. & Arbeláez, M. 2022. Model for Innovation Management and Continuous Improvement at EFIGAS. In: 23rd European Conference on Knowledge Management, Vol. 2. Academic Conferences and Publishing International Limited.
- Rezak, R., Djenouhat, A. & Kherbachi, H. 2023. The Role of Innovation Management System ISO 56002 Standard in the Competitive Edge toward Sustainability. *Sumerianz Journal of Business Management and Marketing*, 6(1), pp. 1-8.
- Richards, Y. & Coetzee, R. 2026a. Integrating Continuous Improvement and Innovation Thinking: A Scoping Review. *International Journal of Quality and Reliability Management*. Submitted for publication.
- Richards, Y. & Coetzee, R. 2026b. Integrating continuous improvement and innovation thinking in the banking sector: a case study from South Africa. *International Journal of Lean Six Sigma*, 17(8), pp.56-79.
- Romagny, P., 2024. South Africa's Digital Banking Outperforms Other Nations – Here's Why It Leads. *Fintech News Africa*. Accessed from: <https://fintechnews.africa/42925/fintech-south-africa/south-africas-digital-banking-outperforms-other-nations-heres-why-it-leads/>

- Saldana, J. 2011. *Fundamentals of qualitative research*. Oxford: Oxford University Press.
- Saldana, J. 2021. Coding techniques for quantitative and mixed data. In: *The Routledge reviewer's guide to mixed methods analysis*. (151–160). Routledge.
- Shaw, R. 2018. Implementing Lean Sigma Framework in an Indian Automotive Valve Manufacturing Organisation: A Case Study. *The TQM Journal*, 22(7):708–722.
- Smith, J. & Noble, H. 2014. Bias in research. *Evidence-Based Nursing*, 17, pp. 100–101.
- Soares, V.V. & Navas, H.V.G. 2023. New model for creating innovative solutions in continuous improvement environments. *International Journal of Systematic Innovation*, 7(5):10-29.
- Sodhi, H.S. & Singh, H. 2014. Optimization of end milling process for D2 (steel) by using response surface methodology. *Journal of Production Engineering*, 17(2):73–78.
- Teece, D.J. 2018. Dynamic capabilities as (workable) management systems theory. *Journal of Management & Organization*, 24(3):359–368.
- Teece, D.J. 2025. *Dynamic Capabilities: Foundational Concepts*. Cambridge University Press.
- Teeling, S.P., McGuirk, M., McNamara, M., McGroarty, M. & Igoe, A. 2023. The utilization of Lean Six Sigma methodologies in enhancing surgical pathways and surgical rehabilitation. *Applied Sciences*, 13(12):6920.
- Terry, G., Hayfield, N., Clarke, V. and Braun, V., 2017. Thematic analysis. *The SAGE handbook of qualitative research in psychology*, 2(17-37), p.25.
- Tohidi, H. & Jabbari, M.M. 2012. The importance of innovation and its crucial role in growth, survival and success of organizations. *Procedia Technology*, 535–538.
- Tracy, S.J. 2010. Qualitative quality: Eight 'big-tent' criteria for excellent qualitative research. *Qualitative Inquiry*, 16(10):837–851.
- Tracy, S.J. 2019. *Qualitative research methods: Collecting evidence, crafting analysis, communicating impact*. Hoboken, NJ: John Wiley & Sons.
- Tracy, S.J., 2026. *Practicing qualitative research under the "big tent": Origins, development, and continuing relevance of the eight big-tent framework for qualitative quality*. *Qualitative Inquiry*, 32(3-4), pp.247-256
- Velu, S.J.S., Jusoh, M.S., Yusuf, D.M., Rosli, A.G.M. & Din, M.H. 2021. Six Sigma in semiconductor: Continuous improvement in production floor area. *Journal of Physics: Conference Series*, 2129(1):012036.
- Wang, L., Drama, B. G. H. and Shen, Y., 2012. Continuous Process Improvement in Banking Sector and a Model Design for Performance Enhancement. *International Journal of Business and Management*, 7(2), pp.130-140

- Wild, S. 2015. *Innovation shaping South Africa through science*. Johannesburg: Gordon Institute of Business Science.
- Winter, R. & vom Brocke, J. 2021. *Teaching design science research*. Forty-Second International Conference on Information Systems, Austin 2021
- Womack, J. & Jones, D. 1996. Lean thinking: Banish waste and create wealth in your corporation. *Journal of the Operational Research Society*, 48(11):1148.
- Worley, J.M. & Doolen, T.L. 2006. The role of communication and management support in a lean manufacturing implementation. *Management Decision*, 44(2):228–245.
- Yasar, N.B., Sezen, B. & Karakadilar, I.S. 2019. Mediating effect of continuous improvement on the relationship between innovation and financial performance. *Total Quality Management & Business Excellence*, 30(7–8):893–907.
- Yazan, B. 2015. Three approaches to case study methods in education: Yin, Merriam, and Stake. *The Qualitative Report*, 20(2):134–152.
- Yin, R.K. 2018. *Case study research and applications*. 6th ed. Thousand Oaks, CA: Sage.
- Yip, S.Y., 2024. *Positionality and reflexivity: negotiating insider-outsider positions within and across cultures*. International journal of research & method in education, 47(3), pp.222-232.
- Zhuo, Z. (2019), “Research on using six sigma management to improve bank customer satisfaction”, International Journal of Quality Innovation, Vol. 5 No. 1, p. 3, doi: 10.1186/s40887-019-0028-6.
- Zu, X., Fredendall, L.D. & Douglas, T.J. 2008. The evolving theory of quality management: The role of Six Sigma. *Journal of Operations Management*, 26(5):630–650.

ADDENDUM A: LIST OF CI TOOLS USED

Table 1: List of CI tools used

Lean	Six Sigma	Lean Six Sigma	TQM	TPM	8D
Kaizen	Quality Management	5 Principles of Lean	Customer Focus	Kaizen	Root cause analysis
Kanban	Design of Experiments (DOE)	5S	Just in Time (JIT)	Quality Management	
Layout management	Kaizen	Brainstorming	Process management		
Poka Yoke (Mistake proofing)	Variation deduction	FMEA	Pull vs push		
Process Mapping: Flow chart, SIPOC	Data analytics	Just in Time (JIT)	Quality Management		
Pull vs Push	Regression & Correlation	Kaizen	Relative proximity theory		
Quality Management: QCD: Quality-cost-delivery	Visual Management	Poka Yoke (Mistake proofing)	Workload balancing		
Root cause Analysis: Fishbone/Ishikawa diagram, 5 Whys	Process Mapping: Flow chart, SIPOC	Process Mapping: Flow chart, SIPOC			
Senge's five disciplines	FMEA	Project Charter			
Simulation	Statistical Process Control (SPC)	Quality function deployment (QFD)			
Standardisation	Theory of Constraints/Bottleneck identification	Quality management: CTQ			

Lean	Six Sigma	Lean Six Sigma	TQM	TPM	8D
Statistical Process Control	Root cause Analysis: Fishbone/Ishikawa diagram, 5 Whys	RACI			
Theory of Constraints/Bottleneck identification	Voice of Customer (VOC)	Root cause Analysis: Fishbone/Ishikawa diagram, 5 Whys			
Value adding, non-value adding and wastes (8 types of wastes)	ISO standards	Senge's fifth discipline			
Value stream mapping (VSM)	Standard operating procedure (SOP)	Stakeholder engagements			
Visual management	Visual Management	Standardisation			
Workload balancing/ Takt time.	Brainstorming	Statistical Process Control (SPC)			
	Workload balancing/ Takt time.	Theory of Constraints/Bottleneck identification			
	Batch management: One-piece flow	Voice of customer (VOC)			
	Poka Yoke (Mistake proofing)	Value adding, non-value adding and wastes (8 Types of wastes)			
	5S	Value stream mapping			
	Quality function deployment (QFD)	Visual Management			
	Total Quality Management (TQM)	Total Quality Management (TQM)			

ADDENDUM B: LIST OF INNOVATIONS TOOLS USED

Table 1: List of Innovations tools used

ARIZ/TRIZ	Design Thinking	Creativity	Kano Model	Action Research	Eco-Compass
Contradictions Matrix (CM)	Problem framing	Brainstorming/mind mapping	Customer Satisfaction Analysis	None mentioned	None mentioned
Brainstorming	User focus and analysis	Six Thinking hat	Product/Service Feature Analysis		
Innovation matrix	Diversity and Visualisation				
Solution standardisation	Prototyping and iteration				
Inventive algorithm	Empathy maps				
Nine window creativity technique	Visualisation				
	Journey mapping				

ADDENDUM C: LIST OF FINAL ARTICLES USED AND CI METHODOLOGIES APPLIED

Table 1: List of final articles used, and CI methodologies applied

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
1	8D Problem Solving Methodology: Continuous Improvement in Automation Organization.	Elangovan, S., Jusoh, M.S., Yusuf, D.M., Ismail, M.S. and Din, M.H., 2021.		1				1				
2	A discussion of the synergy and divergence between lean six Sigma and person-centred improvement sciences. International	Teeling, S.P., Dewing, J. and Baldie, D., 2020.			1							
3	Extension of the Lean 5S methodology to 6S with an additional layer to ensure occupational safety and health levels.	Jiménez, M., Romero, L., Fernández, J., Espinosa, M.D.M. and Domínguez, M., 2019.			1							
4	Frameworks for integrating learning analytics with the electronic health	Pusic, M.V., Birnbaum, R.J., Thoma, B., Hamstra, S.J., Cavalcanti,	1								1	

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	record. The Journal of Continuing Education in the Health Professions	R.B., Warm, E.J., Janssen, A. and Shaw, T., 2023.										
5	Green procurement and green innovation for green organisational legitimacy and access to green finance: The mediating role of total quality management.	Acquah, I.S.K., Baah, C., Agyabeng-Mensah, Y. and Afum, E., 2023.				1						
6	A framework for lean implementation in preoperative assessment: Evidence from a high complexity hospital in Italy.	Goretti, G., Pisarra, M., Capogreco, M.R. and Meroni, P., 2023.			1							
7	Healthcare engineering: a Lean management approach.	Abdallah, A.A., 2020.			1							
8	Implementation of the “5S-Kaizen-TQM” approach into	Hammami, S., Hmida, F., Gharbi, H., Salah, A.B. and Hamouda, C., 2022.			1	1						

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	public Hospital in Tunisia.											
9	Improvement studies for equitable and evidence-based innovation: an overview of the 'IM-SEEN' model.	Allen, L.N., Nkomazana, O., Mishra, S.K., Gichangi, M., Macleod, D., Ramke, J., Bolster, N., Marques, A.P., Rono, H., Burton, M. and Kim, M., 2023.										
10	Improvements to healthcare waste management at regional referral hospitals in Tanzania using the KAIZEN approach.	Ishijima, H., Miyamoto, N., Masaule, F. and John, R., 2022.	1			1						
11	Improving performance of the hospitalisation process by applying the principles of Lean Thinking.	Fiorillo, A., Sorrentino, A., Scala, A., Abbate, V. and Dell'avarsana Orabona, G., 2021.			1							
12	Quality by design (QbD) approach in marketing authorisation procedures of non-	Zagalo, D.M., Sousa, J. and Simões, S., 2022.		1		1						

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	biological complex drugs: a critical evaluation.											
13	Quality, knowledge, and innovation of manufacturing processes in Ciudad Juárez, Mexico.	Mendoza-Arviso, U. and Thelma Solís-Rodríguez, F., 2022.		1								
14	Real-time energy flow mapping: A VSM-based proposal for energy efficiency.	Fontoura, L., de Mattos Nascimento, D.L., Neto, J.V., Garcia-Buendia, N., Garza-Reyes, J.A., Lima, G.B.A., Tortorella, G.L., Caiado, R.G.G. and Meiriño, M.J., 2023.	1									
15	Relationship between continuous improvement and innovation performance: an empirical study in Brazilian manufacturing companies.	Lizarelli, F.L., de Toledo, J.C. and Alliprandini, D.H., 2021.			1	1	1					
16	Research Resiliency through Lean Labs.	Dagdeviren, C., Durak, T. and Sadat, D., 2020.			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
17	Resource-constrained innovation method for sustainability: application of morphological analysis and TRIZ inventive principles.	Liu, Z., Feng, J. and Wang, J., 2020.										
18	Six Sigma in Semiconductor: Continuous Improvement in Production Floor Area.	Velu, S.J.S., Jusoh, M.S., Yusuf, D.M., Rosli, A.G.M. and Din, M.H., 2021.		1				1				
19	Study of an innovative method based on complementarity between ARIZ, lean management and discrete event simulation for solving warehousing problems.	Moussa, F.Z.B., De Guio, R., Dubois, S., Rasovska, I. and Benmoussa, R., 2019.			1							
20	'That's someone's grandma': Teaching person-centred care in a frailty context.	Robinson, L., Andrew, I., Kenny, L., Garrad, S., Thomson, R. and Fisher, J., 2024.	1									

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
21	The influence of lean management and environmental practices on relative competitive quality advantage and performance.	Agyabeng-Mensah, Y., Ahenkorah, E., Afum, E. and Owusu, D., 2020.	1			1				1		
22	A combined use of TRIZ methodology and eco-compass tool as a sustainable innovation model.	Boavida, R., Navas, H., Godina, R., Carvalho, H. and Hasegawa, H., 2020.										
23	A conceptual integrative model of Kansei Engineering, Kano and TRIZ towards sustainability in services.	Hartono, M., Setijadi, S. and Norwandi, L., 2019.										
24	The use of lean six Sigma for improving availability of and access to emergency department data to facilitate patient flow.	Daly, A., Teeling, S.P., Ward, M., McNamara, M. and Robinson, C., 2021.			1							
25	The Utilisation of Lean Six Sigma Methodologies in	Teeling, S.P., McGuirk, M., McNamara, M.,			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	Enhancing Surgical Pathways and Surgical Rehabilitation.	McGroarty, M. and Igoe, A., 2023.										
26	The integrated effect of Big Data Analytics, Lean Six Sigma and Green Manufacturing on the environmental performance of manufacturing companies: The case of North Africa.	Belhadi, A., Kamble, S.S., Zkik, K., Cherrafi, A. and Touriki, F.E., 2020.			1							
27	Towards a smart lean green production paradigm to improve operational performance.	Fiorello, M., Gladysz, B., Corti, D., Wybraniak-Kujawa, M., Ejsmont, K. and Sorlini, M., 2023.	1									
28	Utilising Lean leadership principles to build an academic primary care practice of the future.	Morduchowicz, S., Lee, J.S., Choi, L., Kivlahan, C., Null, D., Smith, S. and Feldman, M.D., 2020.			1							
29	A framework to assess sustaining continuous	Henrique, D.B., Filho, M.G., Marodin, G., Jabbour,			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	improvement in lean healthcare.	A.B.L.D.S. and Chiappetta Jabbour, C.J., 2021.										
30	A realist inquiry to identify the contribution of lean six Sigma to person-centred care and cultures.	Teeling, S.P., Dewing, J. and Baldie, D., 2021.			1							
31	A view from within: Lessons learned from partnering for continuous improvement.	Harrison, C., Wachen, J., Brown, S. and Cohen-Vogel, L., 2019.	1									
32	Application of lean 6s methodology in an engineering education environment during the SARS-CoV-2 pandemic.	Jiménez, M., Romero, L., Fernández, J., Espinosa, M.D.M. and Domínguez, M., 2020.	1									
33	Application of PDCA cycle management for postgraduate medical students during the COVID-19 pandemic.	Gu, S., Zhang, A., Huo, G., Yuan, W., Li, Y., Han, J. and Shen, N., 2021.	1									
34	Application of the theory of constraints	Tilocca, G., Sánchez, D. and			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	to unveil the root causes of the limited market penetration of micro gas turbine systems.	Torres-García, M., 2023.										
35	Building a quality management system in a core facility: a genomics core case study.	Gregory, C.W., 2020.		1								
36	Collaboration versus concreteness: Tensions in designing for scale.	Cannata, M. and Nguyen, T.D., 2020.	1									
37	Continual improvement of online and blended teaching using relative proximity theory.	MacLeod, K.R., Swart, W.W. and Paul, R.C., 2019.			1	1						1
38	Continuous improvement behaviors and impacts on innovation.	Lizarelli, F.L., Toledo, J.C.D., Gambi, L.D.N. and Gonçalves, C.L., 2023.			1							
39	Decreasing the environmental impact in an egg-producing farm	Estrada-Gonzalez, I.E., Taboada-González, P.A., Guerrero-Garcia-	1									

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	through the application of LCA and lean tools.	Rojas, H. and Marquez-Benavides, L., 2020.										
40	Design thinking for sustainability: Why and how design thinking can foster sustainability-oriented innovation development.	Buhl, A., Schmidt-Keilich, M., Muster, V., Blazejewski, S., Schrader, U., Harrach, C., Schäfer, M. and Süßbauer, E., 2019.										
41	Design-Based Implementation Research (DBIR): An Approach to Propagate a Transformed General Chemistry Curriculum across Multiple Institutions.	Underwood, S.M. and Kararo, A.T., 2021.	1									
42	Designing a Mobile Application for Children with Dyslexia in Primary Education Using Augmented Reality.	Lazo-Amado, M. and Andrade-Arenas, L., 2023.	1									
43	Developing a probabilistic decision-making model for reinforced	Koc, K., Ekmekcioğlu, Ö. and Işık, Z., 2023.	1									

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	sustainable supplier selection.											
44	Developing a university-accredited Lean Six Sigma curriculum to overcome system blindness.	McNamara, M. and Teeling, S.P., 2019.			1						1	
45	Developing an evaluation tool to provide a 360-degree reflection on work-integrated learning in accounting education.	Lewis, G.K., Williams, B., Allen, S., Goldfarb, B., Lyall, K., Kling, R. and Statham, P., 2021.			1							
46	Digital lean manufacturing- Collaborative university-industry education in systems design for lean transformation.	Raweewan, M. and Kojima, F., 2020.	1									
47	Dynamic capabilities linking lean practices and sustainable business performance.	Mohaghegh, M., Blasi, S. and Groessler, A., 2021.	1			1	1		1			

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
48	Effects of innovation, total quality management, and internationalisation on organisational performance of higher education institutions.	Texeira-Quiros, J., Justino, M.D.R., Antunes, M.G., Mucharreira, P.R. and Nunes, A.D.T., 2022.				1						
49	Innovation realisation with the support of TQM practices: A perspective from Iran's tire industry	Anvari, M & Anvari, A., 2022			1	1						
50	Integrating safety, health, and environmental management system: A conceptual framework for achieving lean enterprise outcomes	Kruse, T., Veltri, A, Branscum, A., 2019	1									
51	Introduction to EQIPD quality system	Bespalove et al., 2021			1							
52	Investing in lean manufacturing practices (LMP): an	Bai, C., Satir, A., Sarkis, J., 2019			1		1					

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	environmental and operational perspective											
53	Is lean synergistic with sustainable supply chain? An empirical investigation from emerging economy	Jakhar, S.K., Rathore, H., Mangla, S.K., 2019			1							
54	Lean management and innovation performance	Abdallah, A.B., Dahiyat, S.E., & Matsui, Y., 2019			1	1	1					
55	Lean six Sigma: a clinical treatment for the recovery of Indian manufacturing sector from the after effects of coronavirus	Sodhi, H.S., 2020		1	1							
56	Learning Active implementation frameworks: the role of implementation teams in a case study from Pakistan	Hamid, S., et al., 2020	1									
57	Mediating effect of continuous improvement on the relationship between	Yasar, N.B., Sezen, B., & Karakadilr, I.S., 2019			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	innovation and financial performance											
58	The OASIS-SNF: a new and simplified approach to implement sustainable production in nanomanufacturing pilot lines and evaluate its sustainable manufacturing performance	Lopez delpina et al., 2021	1									
59	New Model for Creating Innovative Solutions in Continuous Improvement Environments	Soares, V.V. and Navas, H.V.G., 2023	1									
60	Integrating Theory of Constraints, Lean and Six Sigma: a framework development and its application	Gupta, M., Digalwar, A., Gupta, A. and Goyal, A., 2022			1							
61	Development of a framework for	Alblooshi, M., Shamsuzzaman, M.,			1							

Article nr	TITLE	SOURCE (AUTHOR, DATE)	Lean	6 Sigma	Lean 6 Sigma	TQM	TPM	8D	Agile	RCQA	Senge 5 th Discipline	Relative Proximity Theory
	utilising Lean Six Sigma's intangible impacts in creating organisational innovation climate	Karim, A., Haridy, S., Shamsuzzoha, A. and Badar, M.A., 2022										
62	Dynamic sigma-TRIZ solution model for manufacturing improvement and innovation, case study in Thailand	Karnjanasomwong, J. and Thawesaengskulthai, N., 2019			1							

ADDENDUM D: METHODOLOGIES IDENTIFIED IN THE FINAL ARTICLE SET

This addendum summarises the continuous improvement and innovation methodologies identified in the final set of articles included in the scoping review (Chapter 4). The purpose of this appendix is to demonstrate how the literature informed the methodological foundations of the Continuous Improvement and Innovation (CII) integration model developed in this study.

During the scoping review, each included article was analysed to determine whether specific continuous improvement or innovation methodologies were applied. The analysis focused on methodologies commonly associated with continuous improvement and innovation practices, including Lean, 6 Sigma, combined Lean 6 Sigma, TQM, TPM, 8D, Agile, RCQA, RPT, TRIZ/ARIZ, Design Thinking, creativity-based approaches, Kano analysis, Action Research, and Eco-Compass.

Rather than presenting the full article-by-methodology coding matrix within the main body of the thesis, this addendum summarises the frequency with which these methodologies appeared across the reviewed studies. This approach provides a clearer analytical overview of methodological patterns within the literature and highlights the relative prominence of different approaches.

The results show that continuous improvement methodologies, particularly Lean 6 Sigma-based approaches, appear most frequently in the reviewed studies. Innovation-oriented methodologies such as TRIZ/ARIZ and Design Thinking appear less frequently but remain important in studies focusing on structured innovation processes. Other approaches, including TPM, 8D, Agile, RCQA, RPT, Kano analysis, Action Research, and Eco-Compass, occur more sporadically within the literature.

These observations informed the methodological considerations used in the development of the integrated CII model. Specifically, the findings highlight the dominance of Lean 6 Sigma-based improvement practices in organisational contexts and the comparatively limited but growing integration of structured innovation methodologies.

Table D1 summarises the frequency with which the identified methodologies appeared across the reviewed articles.

Methodologies Identified in the Final Article Set

A total of 62 articles were included in the final scoping review. The review identified several continuous improvement and innovation methodologies applied in the literature. Table D1

summarises the frequency with which the most commonly used methodology appeared across the included studies.

Table D1: Frequency of Most Frequent Methodologies in the Reviewed Articles

Methodology	Number of Articles	Percentage
Lean Six Sigma	30	48%
Lean	20	32%
TQM	18%	11
Six Sigma	10%	6
TRIZ/ARIZ	10%	6
Design Thinking	6%	4

Total articles analysed: 62

Interpretation of Results

The analysis shows that Lean 6 Sigma methodologies dominate the literature, appearing in nearly one-third of the reviewed articles. This finding aligns with previous research indicating that Lean 6 Sigma principles are widely applied as the foundation for continuous improvement initiatives.

Innovation-focused methodologies such as TRIZ/ARIZ and Design Thinking appear less frequently, but their presence suggests increasing interest in integrating structured innovation approaches with traditional improvement frameworks.

Methods such as TQM, TPM, 8D, Agile, RCQA, RPT, Kano analysis, Action Research, and Eco-Compass appear only sporadically, indicating that these approaches are less commonly integrated into continuous improvement & Innovation initiatives in the reviewed literature. These findings informed the selection and integration of methodologies within the Continuous Improvement and Innovation (CII) integration model developed in this study.

ADDENDUM E: COMPLIANCE MATRIX

Table 1: Compliance Matrix

Requirement code	Requirement from Chapter 6	Model element(s) that satisfy the requirement	Cross-reference to heading
FR1	Integrate CI and Innovation as complementary processes, not opposing paradigms.	Chapter 7: Conceptual model overview (Figure 7 - 2)	7.2. Introduction and development of the Conceptual Model.
FR2	Include structured, phased steps for project identification, problem-solving, and solution rollout.	Four phase roadmap (Figure 7 - 2) Phase descriptions 7.2.2	Phases of the model
FR3	Support iterative refinement and validation of ideas and solutions (DMAIC, PDCA, prototyping).	Iterative loop overlay (Figure 7-2)	

Require ment code	Require ment from Chapter 6	Model elemen t(s) that satisfy the require ment	Cross-reference to heading
			Continuous Improvement and Innovations Integrated Model The diagram illustrates the Continuous Improvement and Innovations Integrated Model across four maturity levels: Maturity level: 1 (All/Specialised): - Phase 1: Identification and define (Start: CI: Six Sigma → Define; Start: CI: Lean → Plan) - Phase 3: Solutioning/Improvement (Measure, Analyse, Improve, Control; Do, Check; I: Creativity) - Basic Customer Focus: Through entire lifecycle Maturity level: 2 (All): - Phase 1: Identification and define (Start: I: Design thinking → Empathize, define, Ideate) - Phase 3: Solutioning/Improvement (Prototype, Test) - Higher Customer Focus: Through entire lifecycle Maturity Level: 3 (Support Team): - Phase 2: Project and Solutions Library (Start: I: Triz/Ariz → Existing: Project & solutions Library) - Internal flow to Phase 3 Maturity level: 4 (Research Team): - Phase 2: Project and Solutions Library (External flow to External projects and solutions)
			Figure 7-2 Continuous Improvement and Innovations Integrated Conceptual Model
FR4	Align improvement initiatives with Continuous Improvement operational improvements (Incremental) and long-term strategic innovation	Alignment matrix Table 2-3	Table 2-3: DMAIC & PDCA overlap

Require ment code	Require ment from Chapter 6	Model elemen t(s) that satisfy the require ment	Cross-reference to heading
	n (Radical).		
C1	The model shall operate within compliance heavy, risk averse banking regulations.	Figure 6-1	Figure 6-1: Report Structure: Design Requirements
C2	The model shall fit hierarchical, siloed structures without requiring wholesale culture change.		Maturity levels
C3	The model shall respect the time/resource limits of operational teams.	Lean resourcing guidelines	Continuous Improvement and Innovations Integrated Model
C4	The model shall accommodate hybrid CI/Innovation maturity	Maturity levels	Maturity levels

Require ment code	Require ment from Chapter 6	Model elemen t(s) that satisfy the require ment	Cross-reference to heading
	across departme nts.		
P1	The model shall leverage establis hed Lean Six Sigma routines.	DMAIC thread	Maturity Level of the OrganisationCI and Innovations Methodologies and methodology steps
P2	The model shall incorpora te Design Thinking and TRIZ tools in exploratio n phases.	Methodo logy detail	Maturity Level of the OrganisationCI and Innovations Methodologies and methodology steps
P3	The model shall offer a maturity- based scaling path for gradual adoption.	Adoption process	Maturity levels
P4	The model shall run CI and Innovatio n steps in parallel, not sequentia l silos.	Parallel process map (Figure 6-1)	Figure 6-1: Report Structure: Design Requirements

Require ment code	Require ment from Chapter 6	Model elemen t(s) that satisfy the require ment	Cross-reference to heading
R1	The model shall define tiered responsibilities from awareness to specialist level.	Roles	Role players
R2	The model shall create bridging roles connecting process and innovation teams.	Roles	Role players
R3	The model shall establish a research scouting team for external solutions.	Research team function	Role players
R4	The model shall embed structured upskilling pathways for role progression.	Phases pathway roadmap	Phases

Requirement code	Requirement from Chapter 6	Model element(s) that satisfy the requirement	Cross-reference to heading
S1	The model shall provide a searchable project/solution library.	Solutions Library schematic F	Phase 3: Solutioning/Improvement
S2	The model shall integrate with existing BI dashboards and KPI systems.	KPI integration layer	Phase 4: Standardisation and sustainability

ADDENDUM F: LANGUAGE EDITING CERTIFICATE



Certificate of Language Editing

I confirm that I, Luan Krige, edited the document entitled:

**Development of an integrated continuous improvement
and innovation thinking model for a South African Bank**

By **Y Richards**

On 20 April 2026. The document was edited with respect to
English grammar and spelling, and limited lay-out changes
were made in keeping with standard practices.

A handwritten signature in black ink, appearing to read "L Krige".

Mr Luan Krige

20 April 2026

*(Professional Editors' Guild
Membership No: KRI008)*



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ADDENDUM G: DECISION ON MANUSCRIPT

FW: International Journal of Lean Six Sigma - Decision on Manuscript ID IJLSS-06-2025-0176.R1

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Subject: Fw: International Journal of Lean Six Sigma - Decision on Manuscript ID IJLSS-06-2025-0176.R1

From: International Journal of Lean Six Sigma <onbehalf@manuscriptcentral.com>
Sent: Friday, October 31, 2025 12:34 AM
To: Y Richards <11726830@mynwu.ac.za>
Subject: International Journal of Lean Six Sigma - Decision on Manuscript ID IJLSS-06-2025-0176.R1

30-Oct-2025

Dear Ms. Yolande Richards:

Manuscript ID IJLSS-06-2025-0176.R1 entitled "Integrating Continuous Improvement and Innovation Thinking in the Banking Sector: A Case Study from South Africa" which you submitted to the International Journal of Lean Six Sigma, has been reviewed. The comments of the referee(s) are included at the bottom of this letter.

The referee(s) have recommended publication, but also suggest some minor revisions to your manuscript. Therefore, I invite you to respond to the referee(s)' comments and revise your manuscript.

To revise your manuscript, log into <https://mc.manuscriptcentral.com/ijlss> and enter your Author Centre, where you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using a word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by using the track changes mode in MS Word or by using bold or coloured text.

Once the revised manuscript is prepared, you can upload it and submit it through your Author Centre.

When submitting your revised manuscript, you will be able to respond to the comments made by the referee(s) in the space provided. You can use this space to document any changes you make to the original manuscript. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the referee(s).

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to the International Journal of Lean Six Sigma, your revised manuscript should be uploaded as soon as possible. If it is not possible for you to submit your revision in a reasonable amount of time, we may have to consider your paper as a new submission.

Once again, thank you for submitting your manuscript to the International Journal of Lean Six Sigma and I look forward to receiving your revision.

Sincerely,
Prof. Jiju Antony
Editor, International Journal of Lean Six Sigma
jiju.antony@northumbria.ac.uk