UTS UNIVERSITY OF TECHNOLOGY SYDNEY

Digital Transformation through Platformisation

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Lana Kovacevic-Opacic, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy (Information Systems), in the School of Professional Practice and Leadership in the Faculty of Engineering and Information Technology at the University of Technology Sydney at the University of Technology Sydney.

This thesis is entirely my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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List of Key Terms

Term	Definition	Sources
Actor	An actor is considered a human agent in this thesis, which executes actions to meet organisational goals.	(Liu and Yu 2004)
Application	Applications are collections of IT capabilities designed for specific actor needs within one or more domains.	(Hanseth and Lyytinen 2010)
Business Ecosystem	A constellation of agents (e.g. firms, individuals and customers) marked by collaborative or competitive dynamics.	(Gawer 2014; Lusch and Nambisan 2015; Jacobides et al. 2018)
Digital infrastructures (DIs)	Digital technologies and organisational structures underpinning core operations, sometimes referred to as the installed base.	(Hanseth and Lyytinen 2010; Tilson et al. 2010)
Digital platform	Digital platform is a generative, socio-technical system, with the ability to continually evolve owing to its flexible architecture and value-adding interactions of heterogeneous stakeholders.	(Hanseth and Lyytinen 2010; Törmer 2018 b)
Digital transformation (DT)	A socio-technical process driving organisational change, which is driven by digital technologies.	(Hanelt et al. 2020; Nadkarni and Prügl 2020)
Digitising	A computerised process of transforming analogue signals into binary digits.	(Tilson et al. 2010)
Digitalisation	A socio-technical process of digitising social and institutional infrastructures.	(Tilson et al. 2010)

Ecosystem	A constellation of interrelated actors and other organisational arrangements, including the digital platform.	(de Reuver et al. 2017) (Lusch and Nambisan 2015)
Enterprise platform	A digital platform supporting core work processes in an organisation, such as document management or customer management.	(Vestues and Rolland 2021)
External ecosystem	Shifting value creation from inside to outside of the organisation. It includes the digital platform, as well as internal and external stakeholders.	(Leijon et al. 2017; Jacobides et al. 2018)
Extreme contexts	To distinguish them from more stable contexts, the events instigated by COVID-19 pandemic are referred to as extreme contexts.	(Snowden and Boone 2007)
Generativity	The ability of a system to produce change spontaneously without relying on external input.	(Zittrain 2009; Tilson et al. 2010)
IT capability	IT capability can be considered an actor-generated affordance (such as a text editor).	(Hanseth and Lyytinen 2010)
Interface	Design rule stipulating the relationships between the digital platform and the modules through principles of loose-coupling.	(Baldwin and Woodard. 2009; Tiwana et al. 2010)
Internal ecosystem	An internal ecosystem, supporting cross-organisational synergies and consisting of internal stakeholders. The ecosystem consists of coevolving sets of actors, business processes, resources and platforms.	(Yoo et al. 2012; Törmer 2018; Wang 2021)
Module	A loosely-coupled component or subsystem	(Baldwin and Woodard. 2009; Tiwana et al. 2010)

	that extends the functionality of the digital platform.	
Platform Architecture	A framework that organises a digital platform into a stable core and auxiliary modules, governed by design rules that mandate its design and evolution.	(Hanseth and Lyytinen 2010; Tiwana et al. 2010; Blaschke et al. 2019)
Platformisation	The process of transforming to a platform architecture and evolving the digital platforms in an organisation.	(Bygstad and Hanseth 2018; Rodon 2018; Törmer and Henningsson 2020; Alt 2022)
Platform Governance	Defining who is accountable for the decisions pertaining to a digital platform.	(Tiwana et al. 2010; Huber et al. 2017)
Platform Ecosystems	A model consisting of a digital platform, a platform owner and a set of third-party contributors. For example, that of Apple, Amazon or SAP.	(Ghazawneh and Henfridsson 2013; Selander et al. 2013; Karhu et al. 2018; Schreieck et al. 2022)
Platform Organisation	The focal organisation in the ecosystems, which connects different parties together and manages their interactions.	(Chen et al. 2021; Meijer and Boon 2021)
Strategising	The continuous strategic processes and practices leading to organisational outcomes.	(Pettigrew 1992; Henfridsson and Lind 2014; Chanias et al. 2019)

Abstract

The rise of digitalisation continues to impact organisations and the society at a staggering rate. Digital technologies are spawning intricate networks of socio-technical systems characterised by fluid boundaries and growth on an exponential scale. As the very nature of competition transforms, and consumer behaviour evolves, digital innovation continues to thrive and transform organisations and entire industries. The recent years bear witness to an emerging phenomenon of digital transformation (DT), as more organisations are impelled to adapt to this increasing digitalisation. This calls for new theories and empirical studies on the effects of DT, reflected in the increased interest in the topic in the academic and the practitioner communities alike. Digital technologies play a key role in DT. Indeed, Internet of Things (IoT), artificial intelligence (AI), robotic automation, blockchain and analytics are some of the technologies driving this change. There is also a growing recognition that digital platforms, as a new, generative type of system have implications for DT. Converging these two streams of literature to generate new insights, this study proposes platformisation as a salient view to consider regarding DT. The over-emphasis on platform ecosystems in the extant digital platform literature (such as those of Apple and Google) has resulted in an under-representation of internal digital platforms within the boundaries of a single organisation. This highlights a promising new avenue to explore in tandem with DT. In particular, incumbent organisations with complex technical infrastructures and portfolios cannot apply the logic of platform ecosystems in implementing digital platforms in their organisations. Yet, they can still leverage the platform concept to make improvements to their organisations. However, our understanding of the process of platformisation, as a systematic, organisation-wide transformation of an organisation's systems into platform architectures, beyond the initial adoption of digital platforms remains limited. This research explores DT through platformisation in the single organisational context of an Australian university, through three cases of digital platforms. Each digital platform contributes to the university's overall DT through platformisation efforts. Adopting the theoretical lens of coevolution, DT through platformisation is conceptualised as an interplay between the strategic and the digital platform levels in the organisation, recognising the strategy level as an ongoing and dynamic process of strategising. More specifically, this study explores the mechanisms of DT through platformisation, as well as the organisational outcomes of this process. This has important implications for both theory and practice. The theoretical contributions lie in a theoretical model and a theoretical framework of mechanisms of DT through platformisation, the articulation of three types of internal digital platforms, as well as a set of theoretical propositions. As a contribution to practice, the rich empirical insights from three case studies can help guide DT through platformisation efforts. This research can also inform leaders in formulating strategies and operating models with digital platforms. The mechanisms presented in this study can be further refined and applied in other organisational contexts.

Chapter 1: Introduction

In this chapter, I introduce the background on the research topic and the motivation for this research. Then, I present the research aim, objective and the scope of the research. Following an overview of this dissertation highlighting the foci of the study, I present the structure of this thesis.

1.1 Background and Motivation

The digital era propelled by the rise of digitalisation is fuelling the Fourth Industrial Revolution and fundamentally transforming organisations, economies and the broader society (Vey et al. 2017; Teubner and Stockhinger 2020). Digital technologies have become inextricably entrenched in our existence, creating a coevolving intertwinement between human agency and materiality, spawning complex socio-technical systems that are profoundly distinct from complex physical or social systems (Tilson et al. 2010; Benbya et al. 2020). The generativity afforded by digital technologies generates systems that are more open and dynamic, with fluid boundaries and ostensibly *ad infinitum* evolutionary trajectories (Yoo 2013).

The promulgation of digital technologies across industries and sectors has given rise to a phenomenon of digital transformation (abbreviated to DT in this thesis). Incumbent organisations in particular are forced to adapt to stay competitive in an increasingly digital world (Chanias et al. 2019; Vial 2019). We bear witness to a number of traditional industries being transformed by digital technologies, including media (Karimi and Walter 2015), banking (Sia et al. 2021), health (Agarwal et al. 2010; Hermes et al. 2020), and industrial manufacturing (Sandberg et al. 2020; Jovanovic et al. 2022). For these organisations DT is often imbued with the challenge of complex socio-technical arrangements and structures accumulated over many years (Bygstad and Hanseth 2018). These factors can lead to inertia and limit an organisation's ability to adapt to a dynamic environment (Lyytinen and Newman 2008; Rolland et al. 2018).

Consequently, DT is becoming a strategic imperative for organisations in the near future (Hanseth and Rodon Modol 2021; McKinsey 2021b). Organisations world-wide are collectively investing trillions of dollars into DT (Urbinati et al. 2021). Yet, DT is also associated with high failure rates. An alarming 87.5% of DT projects end up failing (Wade and Shan 2020), with organisations losing billions of dollars in the process (Tabrizi et al. 2019). Alternatively, DT efforts have been observed to veer off the intended course (Wimelius et al. 2020). A part of the challenge is that DT is considered more complex and harder to execute than other types of organisational change (Wade and Shan 2020).

The confluence of environmental turbulence, increasing adaptive velocity of organisational change and the proliferation of digital technologies in all spheres of life is creating conditions that are complex, difficult to manage and often chaotic (El Sawy et al. 2010). The recent onset of the Coronavirus pandemic has precipitated rapid and radical change, accelerating DT for organisations grappling to sustain themselves amidst the crisis (Fritz 2021). Business continuity and resilience have exceeded profitability and productivity as common business goals for DT (Walker 2021). Around 90 percent of organisations have been required to update their business models and increase the speed of their operations as a result of COVID-19, a study has found (McKinsey 2021a).

This creates a sense of urgency for organisations to create and implement strategies for DT to confer their competitive advantage (Hess et al. 2016; Chanias et al. 2019). Digital technologies are considered the locus of DT efforts (Vial 2019), no longer playing an auxiliary role, but being recognised as a key strategic differentiator (Bharadwaj et al. 2013a; McKinsey 2021a). As the reliance on digital technologies increases, implementing DT strategies to

achieve business goals is becoming crucial for organisations of today (Walker 2021). Moreover, the effectiveness of traditional, static forms of strategy-definition are being challenged in favour of more dynamic forms of strategising, apt for the digital age (Chanias et al. 2019; Teubner and Stockhinger 2020).

The pertinence of the topic of DT has been reflected in an upsurge in interest in both the academic (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020) and the practitioner communities (Wade and Shan 2020; Walker 2021) in the recent years. The literature has established DT as distinct from other types of IT-related change (Wessel et al. 2021). A multidisciplinary discourse is starting to emerge, with calls for papers in leading IS journals (Markus and Rowe 2021) and beyond (Bresciani et al. 2021b), corroborating the pressing need for new insights. These calls for papers highlight the *"sparse coverage on theoretical developments or empirical research that can explain the process of digital transformation" (Carroll et al. 2021 p.1).*

Indeed turning our attention to the processes of DT, by examining the mechanisms and outcomes presents an opportunity to diversify the theorising on the topic (Hanelt et al. 2020; Markus and Rowe 2021). Understanding the micro-foundations, or the mechanisms of DT can contribute to a greater clarity on how DT progresses over time as a process (Vial 2019). The nature of a process is longer, as it is comprised of multiple mechanisms, or one mechanism that perseveres in time (Delgado 2022). By the same token, uncovering the organisational outcomes of DT can explain the overall impact of DT on organisations (Bresciani et al. 2021a).

The academic discourse has recently highlighted the importance of revolutionary, new digital technologies, including artificial intelligence (AI), big data (Günther et al. 2017), analytics (Tim et al. 2020), social media (Resca et al. 2013; Rahrovani 2020), Internet-of-Things (IoT), (Haaker et al. 2021), blockchain (Dutra 2018), robotic process automation (Baiyere et al. 2020) and cloud computing (Battleson et al. 2017) for organisations. There is also growing evidence that digital platforms as a generative type of digital technology carry implications for DT, as either sources of opportunity or disruption (Vial 2019; Bygstad 2020; Hanelt et al. 2020; Nadkarni and Prügl 2020).

However, there is a general predilection in the digital platform stream of literature to focus on large, established platform ecosystems in a single product area, such as SAP (Schreieck et al. 2021) or Apple iOS (Ghazawneh and Henfridsson 2013). The key focus of scholarly enquiry in this steam of research has been the boundary-crossing interrelationships from both the perspective of the platform owner (Tan et al. 2015; Ter et al. 2018), as well as the third-party complementors (Selander et al. 2013; Qiu et al. 2017; Schreieck et al. 2021). These studies have mainly been concerned with administering of the platform architecture and governance of such ecosystem (Eaton et al. 2015)**.** This has left the intra-organisational perspective on digital platforms largely neglected, despite numerous organisations today employing digital platforms to support their operations, such as those offered by Google and Microsoft (Rolland et al. 2018; Rolland 2021). Recent insights from Gartner Magic Quadrant indicate a rising demand for internal digital platforms capable of engaging employees, customers and partners (Guseva 2021). Indeed, scholars are recognising the need to extend the scope of digital platform research to include different types of digital platforms in different contexts, particularly in the light of digital platforms emerging in more traditional industries (de Reuver et al. 2017).

If the premise that all digital platforms are structurally the same holds true (Baldwin and Woodard. 2009), a new argument emerges that similar benefits could be realised for internal digital platforms, as in platform ecosystems (Törmer 2018). This makes internal digital platforms a germane topic to explore in the context of DT. To wit, exploring how organisations

and their stakeholders can create and use digital platforms within their organisations becomes an important question to address (Sigríður Islind 2018; Vestues and Rolland 2021).

Despite very considerable interest in both DT and digital platforms, few attempts have been made to espouse these two streams of literature to generate new insights, a phenomenon I call DT through platformisation in this research. To that end, the focus of this thesis is specifically on DT through platformisation, as the main phenomenon and not DT in general. Anecdotal evidence indicates the effectiveness of using a platformisation strategy for DT (Ross et al. 2019; Lansing 2021), which is increasingly recognised in academia (Bygstad and Hanseth 2018; Senyo et al. 2021), in the wider DT literature (Alt 2022). Although the most successful companies in the world are in fact platform organisations, the platform concept can be equally leveraged by traditional, so called pipeline organisations, to revive their technology stacks, optimise their operations and improve customer value (Bygstad and Hanseth 2018; Lansing 2021; Stackpole 2021).

Collectively, extant studies on DT through platformisation have created an impression of dissonance, through varying degrees of common ground, yet differing underlying logic. Corollary to this, we are lacking a coherent view of what platformisation entails and how to achieve it in the context of DT. DT through platformisation is not a desired end-state, but an active, ongoing process of transforming socio-technical arrangements into platforms (Törmer and Henningsson 2020). Yet, ambiguity over how digital platforms emerge and evolve through the process of platformisation persists, with most prior contributions focusing on established digital platforms, (de Reuver et al. 2017; Sigríður Islind 2018; Jovanovic et al. 2022), which cannot be readily applied in the context of DT. Proportionally, focusing on the initial adoption of digital platforms alone, leaves how they stay entrenched and sustained in organisations over time opaque (Carroll and Mc Lafferty 2021).

In sum, the mounting interest in DT from both the academia and practice underscores the significance of advancing research on this phenomenon, with the survival of many organisations hinging on their adaptability in the digital age. This is especially true for incumbent organisations, impeded with complexity of their technical and organisational landscapes. With evidence of its strategic priority, unravelling the mechanisms and organisational outcomes of DT can inform the ongoing discourse and diversify the theorising on the topic.

Digital platforms as a new, generative type of IS carry implications for DT. It is for this reason that studying DT through the particular angle of platformisation presents a promising opportunity for new insights in this research domain. Motivated by these factors, I now turn to the research aim, objectives and scope. I conclude this chapter with an overview of my research and the structure of this thesis.

1.2 Research Aim, Objective and Scope

The primary aim of this study is to theorise DT through platformisation in an organisational context. This is based on the premise that both platformisation and DT are enablers through which an organisation creates value. The objective of this study is to explain how the reciprocally-shaping interactions between the strategic and the digital platform levels lead to DT. The overarching research question is:

How can organisations achieve DT through platformisation?

In order to answer this broad question, the following sub-questions have been devised:

a. *Through which mechanisms does DT through platformisation occur?*

b. What are the organisational outcomes of DT through platformisation?

DT through platformisation is considered here as the overall process, which is elucidated by uncovering specific mechanisms that it is comprised of. This thesis focuses on DT through platformisation within a single organisation. The focus is on the focal organisation only, not the vendors and third-party contributors of digital platforms. Its focus is on an established organisation going through a DT through platformisation, and not a start-up or a small-to-medium enterprise (SME).

1.3 Research Overview

The higher education sector was chosen for this study as a prime example of a traditional industry undergoing a DT. The rise of massive online courses (MOOCs) and other digital pedagogies have exerted pressure on universities to rethink their traditional business models (Niederman et al. 2016). With students demanding more flexible offerings inspired by digital technologies, prior business models are no longer sustainable long-term. Digital platforms are playing a fundamental role in this change, with universities predicted to lose 5% of student enrolments yearly to online learning platforms, if they fail to adapt (Yesner 2020).

This disruptive rate of change has only been accelerated in recent times as a result of COVID-19 pandemic (Seetharaman 2020). The higher education sector was also one of the earliest industry sectors forced to adapt to new modes of operation during the early days of the crisis (Illanes 2020). COVID-19 is also catalysing a longer-lasting change with universities forced to redesign their business models and business processes to find new ways of working and delivering education (HBR 2020; Madsen 2020; Yesner 2020).

The university context remains under-explored in the academic literature, despite practitioner literature highlighting a large DT agenda facing present-day universities (Chen et al. 2019; Yesner 2020). Universities are inherently complex institutions, which are increasingly transforming into even more complex, multi-faceted enterprises (Henkel 1997). Whilst universities are experiencing some of the same challenges most organisations are grappling with today, they are also faced with a unique set of challenges and paradoxes not witnessed in other types of traditional institutions to such a degree (Chen et al. 2019). This includes a need to simultaneously balance profitability and social responsibility (Ramos-Monge et al. 2017). As such, universities as complex organisations provide a prolific ground for studying the DT phenomenon, particularly because many are now leveraging digital platforms to transform their organisations (Bygstad et al. 2022). To date, studies of DT through platformisation have been highly focused on the private sector. To this end, there is an opportunity for expanding the diversity of insights by turning our collective-attention to the public sector, which has been increasingly investing in DT (Senyo et al. 2021).

To answer the research questions, this study employs a multi-case study approach guided by the interpretivist paradigm. Specifically, three case studies were conducted of distinct digital platforms, driving DT within the same organisational context of a large Australian university, referred to in this thesis as AU-U. These three cases provide examples of three different types of internal digital platforms, which collectively contributed to DT in different ways. I refer to these cases as Alpha, Beta and Gamma.

Table 1 — Case Overview

Platform	Description
Alpha	A digital platform supporting the organisation's operations.
Beta	A digital platform fostering cross-organisational collaboration and integration of a functional area.
Gamma	A digital platform yielding new value propositions.

This study employs a socio-technical perspective, as the guiding paradigm in IS (Sarker and Chatterjee 2013). The primary method of data collection were semi-structured interviews with a number of relevant stakeholders. I conducted a total of 31 interviews over a period of 18 months. The data was analysed through iterative cycles of coding (Corbin and Strauss 2008), using the NVivo software. The empirical insights were interpreted through the lens of coevolution theory, as I iterated between cycles of coding and consulting the literature. My choice of theory was deemed suitable for a multilevel analysis of the phenomenon — that is for analysing the reciprocal interactions between the strategic and the digital platform levels. The prevailing single-lens theoretical perspectives (Senyo et al. 2021 ; Vestues and Rolland 2021) cannot adequately capture the complexity of this process, requiring the consideration of multilevel dynamics (Hanelt et al. 2020). The suitability of the coevolution theory for studying DT and platformisation is further echoed in the academic community (Hanelt et al. 2020; Jovanovic et al. 2022).

The analysis was achieved by examining the interplay between the strategic and the digital platform levels in the organisation, as well as factors in the internal and the external environment. Theory building was achieved as the empirical data and theoretical concepts from coevolution theory started to merge in the process of abduction. This resulted in a theoretical model and a number of mechanisms of DT through platformisation. As the mechanisms of DT through platformisation emerged from each case study, a cross-case comparison of the mechanisms followed, where similar mechanisms were merged together. The mechanisms were then organised into different categories according to my interpretation and consultation of the literature. The categories were further organised into a proposed theoretical framework of mechanisms of DT through platformisation. A set of theoretical propositions was derived from the mechanisms to better articulate my contribution.

This thesis makes several contributions to both theory and practice. Firstly, the main theoretical contribution lies in the theoretical model of DT through platformisation, as well as the theoretical framework of mechanisms of DT through platformisation, theorised through the lens of coevolution theory. In doing so, I build on the previous studies on mechanisms in the IS field —(Henfridsson and Bygstad 2013; Bygstad and Øvrelid 2020). Work on mechanisms of DT is extremely scarce, lacking conceptual clarity (Sandberg et al. 2020; Wimelius et al. 2020), or being inferred from prior studies (Hanelt et al. 2020). At the time of writing this thesis, and to the best of my knowledge, this study is the first to produce a framework of mechanisms of DT through platformisation. According to the literature review, no study to date has produced such an extensive list of mechanisms, or made any attempts to categorise them. With this contribution I also answer the call for research on diversifying theorising on DT,

including presenting mechanisms of DT, as well as the outcomes (Hanelt et al. 2020; Markus and Rowe 2021). I also offer a multilevel view of mechanisms enabled by the adoption of the coevolution theory. Prior research has mainly provided one dimensional views of mechanisms (Henfridsson and Bygstad 2013; Huang et al. 2017).

This study also identifies three types of internal digital platforms. With this I contribute to the literature on internal digital platforms (Törmer 2018; Bygstad and Øvrelid 2020), addressing an observable gap in the literature, due to the over-emphasis on platform ecosystems (such as those of Apple and Google) (Ghazawneh and Henfridsson 2013; Eaton et al. 2015). This thesis also generates novel insights by merging two emerging streams of IS research — DT and digital platforms. In particular, by focusing on DT through platformisation in an organisational context, as the angle, I answer the call by de Reuver et al. (2017) for extending the scope of digital platform research and developing a greater understanding as to how digital platforms emerge. The majority of research has focused on established digital platforms or platform ecosystems (Sigríður Islind 2018), which are not relevant in the context of DT.

Focusing on DT within a university, provides a novel perspective to the DT literature in IS and beyond, which to the best of my knowledge has not considered DT in the higher education sector to a great extent. There is a common misconception that universities are outdated institutions, when in reality, certain universities are making considerable investments to transform their organisations into digitally-apt institutions of the future, with ample opportunities for observing DT efforts.

The findings of this thesis also propose two new properties to the kernel coevolution theory, which can be further tested and validated in future research:

- The first proposed property is that of *path-alteration.* A well-known property of coevolution theory is path-dependency, stipulating that coevolution is dependent on history and past choices that are often irreversible. I argue that path-alteration as a property is important to consider for organisations to forge new pathways in order to adapt to their environment.
- The second proposed property is that of *inverse requisite variety.* I have found that if requisite variety, or the ability of the organisation's internal rate of change to match or exceed the rate of change in its external environment drives coevolution, *inverse requisite variety* can act as a damping mechanism. In this instance the rate of change in the external environment is slower than the rate of change required in the internal environment, hence coevolution is stalled or halted.

This research also has implication for practice. The rich empirical evidence of DT through platformisation can provide insights to organisations embarking on the DT journey. More precisely, it can shed light on how organisations can achieve DT by building and evolving digital platforms, whether they buy platform components or build their own. The mechanisms of DT through platformisation presented in this thesis can be adopted and tested in other organisational settings. I also argue that the insights presented here are applicable beyond their immediate context, as they address issues and challenges faced by many organisations undergoing a DT today. Although larger, incumbent organisations may find more inspiration from this thesis due to the size and operations of their organisations, smaller to mid-sized organisations can equally apply some of these concepts to design new strategic initiatives and operating models underpinned by digital platforms. Finally, the theoretical framework for DT through platformisation can be used to organise digital initiatives to support DT efforts. Next, I present the structure of this thesis.

1.4 Thesis Structure

Figure 1 presents the structure of this thesis. In Chapter 2, I review the extant literature on DT, digital platforms and the emerging phenomenon of DT through platformisation, identifying the gaps in knowledge. A discussion of coevolution theory employed in this research and the justification for its use is presented in Chapter 3. I then move on to explain and justify the methodology adopted for this thesis in Chapter 4. In Chapter 5, I present the empirical findings, and then provide a theorisation of these findings in Chapter 6. The findings and the theorisation are discussed in the context of existing literature in Chapter 7, and the contributions of the study elaborated on in Chapter 8. Finally, I reflect on the limitations and opportunities for further research in Chapter 9 and provide a conclusion in Chapter 10.

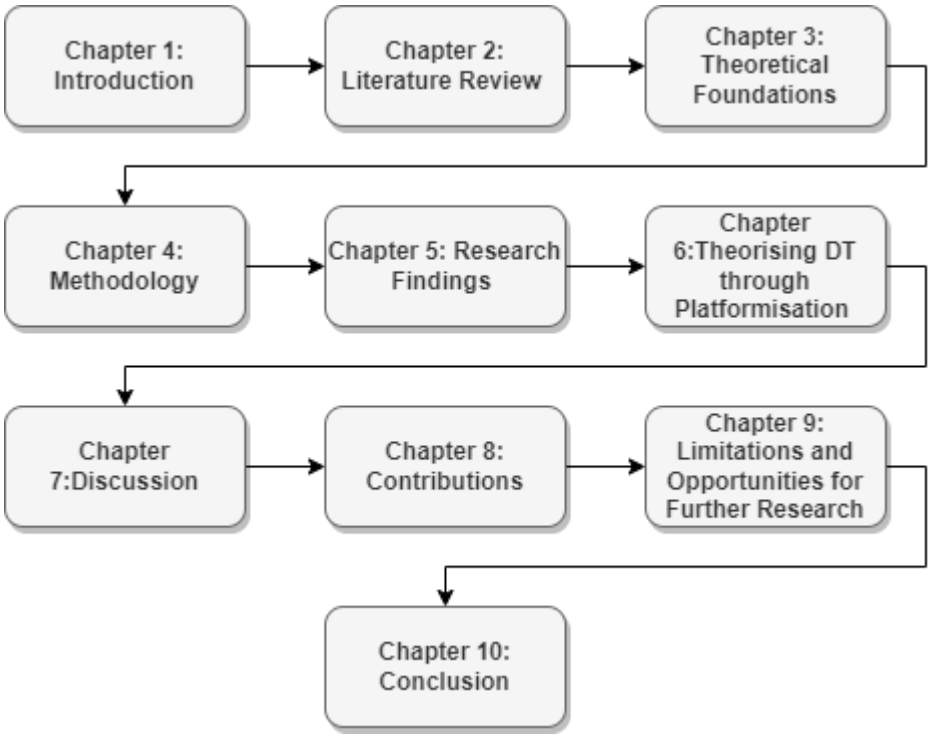

Figure 1 — Thesis structure

Next, I present a review of the relevant literature. To begin with, I take a cursory look at the conceptual foundations underpinning this thesis. Then I discuss the two dominant streams of literature informing this research — DT and digital platforms, as well as an emerging stream considering DT through the angle of platformisation.

Chapter 2: Literature Review

In this chapter, following a brief discussion on the conceptual foundations, I review the literature pertaining to DT, digital platforms and DT through platformisation — an emerging stream combining these two research areas. A discussion of DT literature includes the emergence and the nature of change of this phenomenon, the role of strategy in DT, as well as the drivers, perspectives and mechanisms pertaining to DT. Similarly, perspectives, classifications, as well as the architecture and governance of digital platforms is also discussed. I follow with an overview of literature on DT through platformisation, the triggers and mechanisms, in addition to architecting, designing and developing digital platform for DT and the different organisational outcomes that can be achieved through this process.

Although the multidisciplinary discourse on DT has taken on different perspectives, in this research I adopt a socio-technical view, focusing on digital platforms as the focal point of interest, as well as the social factors that shape their evolution. The majority of the papers reviewed are in the information systems (IS) field, however the broader literature has been considered where relevant. Whilst I acknowledge DT to have broader, societal and economic implications (Kraus et al. 2022), in this thesis I focus on organisational aspects, which are socio-technical in nature. An overview of the reviewed literature is presented in Table 2.

Table 2 — Literature Review Overview

Extant Research	Identified Limitations	References	Addressing the identified limitations
DT	Mechanisms of DT remain a neglected area of research.	(Hanelt et al. 2020; Markus and Rowe 2021)	Focusing on mechanisms of DT
	Digital platforms have not been explored in the context of DT to a great extent.	(Bygstad and Hanseth 2018; Gregory et al. 2018; Cozzolino et al. 2021; Senyo et al. 2021)	Focusing on digital platforms as enablers of DT
	Scarce research on DT in the Higher Education sector.	(Piromalli and Viteritti 2019; Bygstad et al. 2022)	Focusing on the Higher Education sector
Digital platforms	Internal digital platforms are underrepresented. The majority of research in this area focuses on product platforms.	(Gregory et al. 2018; Rolland et al. 2018; Törmer 2018)	Focusing on internal digital platforms within an organisation
	There is an over-emphasis on IoT platforms in	(Sandberg et al. 2020; Haaker et al.	Focusing on enterprise platforms

DT through platformisation	manufacturing industries, as well as DIs in large hospitals.	2021; Ghosh et al. 2022; Jovanovic et al. 2022)	
	Focusing on the adoption of single digital platforms (such as social media platforms) and not the organisation-wide process of platformisation	(Resca et al. 2013; Karimi and Walter 2015; Wimelius et al. 2020; Mandviwalla and Flanagan 2021)	Focusing on the process of platformisation
	The successful outcomes of DT through platformisation remain ambiguous. DT literature emphasises the main outcome as the ability to reinvent value propositions.	(Karimi and Walter 2015; v. Alberti-Alhtaybat et al. 2019; Bygstad 2020)	Focusing on outcomes of DT through platformisation

2.1 Conceptual Foundations

In this thesis, I adopt the general view that DT is organisational change influenced and driven by digital technologies (Hanelt et al. 2020; Nadkarni and Prügl 2020), to improve business outcomes (Wessel et al. 2021). Subscribing to the argument that DT greatly affects pre-digital, established organisations, in traditional industries (Chanias et al. 2019), this study focuses on DT in the higher education sector. DT is inherently a socio-technical change, comprising of technical and social structures (Rolland 2021).

Recognising DT as a more holistic, multilevel phenomenon, I take on the coevolutionary perspective in this research (Hanelt et al. 2020), framing DT as an interplay (Ivarsson 2022) between two levels — strategy and digital platform, in the organisation. Coevolution focuses on the reciprocal interactions between entities and their environments, as opposed to viewing entities in isolation, as is the premise of evolutionary theories (Peppard and Breu 2003)

In line with Chanias et al. (2019), in this thesis, I take on the view that the strategic level in the organisation represents a dynamic form of strategising as a process. In IS, the strategy literature has often been dichotomised into content and process focused streams. The former is concerned with competitive dynamics, whereas the latter seeks to understand how strategic decisions are made and executed (Burgelman et al. 2018). Strategising as a process is denoted as a sequence of actions leading to outcomes (Pettigrew 1992; Tavakoli et al. 2017). There is a recognition that strategising results in the realised strategy contents, and happens as the outcome of deliberate action, as well as emergence (Mintzberg 1987; Henfridsson and Lind 2014).

A digital platform is considered a socio-technical construct in this thesis, comprising of both the technical artefact and the value-adding interactions of the actors contributing to that platform (Lusch and Nambisan 2015; Rolland et al. 2018). Morphologically, digital platforms

consist of a stable core and a set of interconnected, complimentary modules, linked through common design rules or interfaces. A module in a digital platform refers to any subcomponent or subsystem in the digital platform that extends its functionality (Baldwin and Woodard. 2009; Tiwana et al. 2010). However, infrastructures in established organisations consist of a multitude of such digital platforms and micro-services (Vestues and Rolland 2021). For brevity, in this thesis I refer to any digital platform component as a module, although a module might be a full enterprise platform — see Figure 2. Enterprise platforms support an organisation's core work processes and include platforms such as CRM and CMS platforms (Vestues and Rolland 2021).

Arguably, digital platforms are not just modular systems — the ability of the components to be recombined in different ways drives generativity by affording different permutations to spring up (Yoo 2013). Digital platforms support evolving communities of users. They are considered as constellations of IT capabilities and are more complex than applications, due to the heterogeneity of their components. On the other hand, they are less complex than digital infrastructures (DI)s, which are considered more open, distributed and unbound in nature (Hanseth and Lyytinen 2010). Hence, digital platforms are built on top of digital infrastructures (Constantinides et al. 2018).

Digital platforms are commonly discussed in tandem with the broad concept of ecosystems, which is represented as technical by some (Tiwana et al. 2010) and social (e.g. business ecosystems) (Jacobides et al. 2018) or socio-technical by others (Lusch and Nambisan 2015). Platform ecosystems are often represented in the literature as a model consisting of a platform owner and a set of third-party contributors, such as that of Apple or Amazon (Ghazawneh and Henfridsson 2013; Selander et al. 2013). In this thesis, I consider ecosystems as a socio-technical construct, consisting of the digital platform, interrelated actors and organisational arrangements (Lusch and Nambisan 2015; de Reuver et al. 2017).

An internal ecosystem remains within the boundaries of a single organisation (Hein et al. 2019). It consists of the internal digital platform, stakeholders, business processes, structures and organisational resources (Wang 2021). An external ecosystem shifts value creation activities from within an organisation to outside the organisation (Leijon et al. 2017; Jacobides et al. 2018). In this thesis, an external ecosystem refers to the focal organisation and external partners co-creating value around a digital platform for their mutual benefit and that of the public.

This thesis focuses on DT through the angle of platformisation. Platformisation refers to the socio-technical process of transforming to a platform architecture within and across organisations (Bygstad and Hanseth 2018; Törmer and Henningsson 2020), with the focus of this thesis being the intra-organisational perspective. To that end, platformisation in more simple terms can be defined as the emergence and evolution of digital platforms in an organisation (Rodon 2018). Figure 2 provides a conceptual framing of DT through platformisation adopted in this thesis. This view of platformisation is different to that of shifting from products to platforms (Constantinides et al. 2018; Törmer and Henningsson 2020), an organisation opening its platform to external contributors (Benlian et al. 2018), or "the rise of the platform as the dominant infrastructural and economic model" (Helmond 2015 p.1).

Inspired by Snowden and Boon's (2007) Cynefin framework, I refer to the events instigated by the Coronavirus pandemic as extreme contexts. Unlike stable contexts they are the realm of complexity and chaos, characterised by uncertainty, and cannot be understood through cause and effect logic. Chaotic contexts are referred to as the domain of "unknowables", associated with hastened and unanticipated change. With no evident patterns, organisations

require novel practices. Complex contexts are marked by “unknown unknowns” with emergent patterns surfacing through experimentation (p. 5).

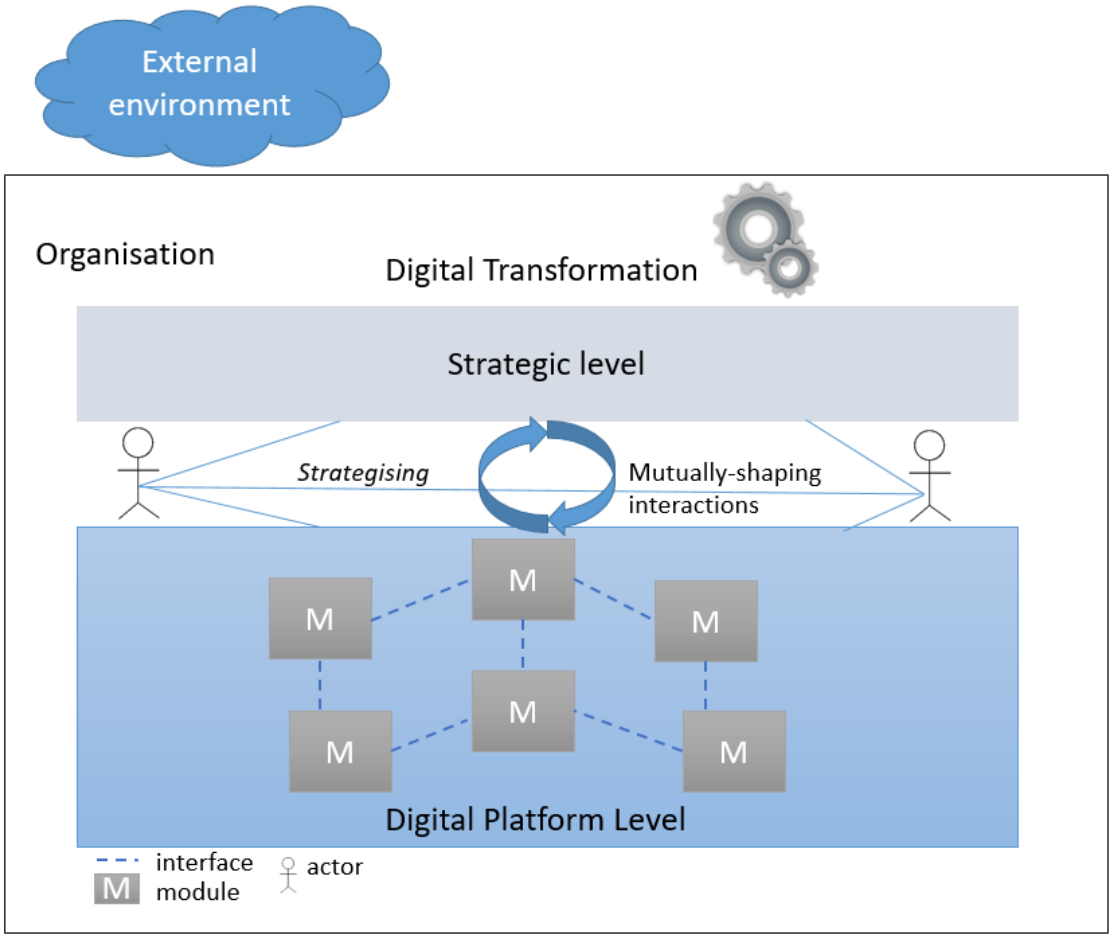

Figure 2 — Conceptual Framing of DT through platformisation

I now go on to discuss the relevant literature on DT.

2.2 Digital Transformation (DT)

Scholarly and practitioner communities have been increasingly drawn to the discourse on DT in the recent years (Noesgaard et al. 2023). This interest has generated a diversity of interpretations and theoretical constructs in need of greater clarity (Markus and Rowe 2023). Nevertheless, a general consensus has been established in the literature of the distinct nature of DT as a phenomenon (Kaganer and Sarker 2023).

2.2.1 The Emergence of the DT phenomenon

Stepping out of the industrial era into a digital one is the impetus behind DT at societal, industry and organisational levels (Kraus et al. 2022). The pervasiveness and generativity of digital technology is driving increasing convergence. Not only are we witnessing the convergence of physical products, as they become embedded with digital properties, but also the convergence of entire industries (Tilson et al. 2010; Yoo et al. 2012).

These trends are heralding changes in consumer expectations, as well as the nature of competition entirely (Berman 2012; Bresciani et al. 2021a; Verhoef et al. 2021). Failure to adapt to this wave of digitalisation could lead to the demise of many organisations today (Hess 2016). As consumer expectations shift, organisations are put under pressure to rapidly offer

new products, services and omni-channel experiences (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020). Indeed, digital innovation has been a prominent theme in IS research over the past decade (Yoo et al. 2010) (Sandberg et al. 2020; Bogers et al. 2021).

We now find ourselves at a cross-roads between digital innovation and the emerging phenomenon of DT, contending that digitalisation has greater implications for organisations than innovation alone (Gregory and Tumbas 2019; Drechsler et al. 2020). Ultimately, ongoing digital innovations have the potential to result in DT over time (Hinings et al. 2018). DT is bringing about changes to the organisational deep structures, necessary to remain competitive in the digital age (Baiyere et al. 2020; Salmela and Galliers 2022). This is necessitating greater integration enabled by consolidated digital process and collaboration tools (Kraus et al. 2021).

Scholarly interest on the topic of DT has amplified in the recent years in the IS field (Baiyere et al. 2020; Wessel et al. 2021) and beyond (Bresciani et al. 2021a; Verhoef et al. 2021; Kraus et al. 2022). Numerous literature reviews providing recommended future research directions have been published in leading journals (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020; Urbinati et al. 2021; Verhoef et al. 2021). This reflects the nascent stage of this phenomenon, lacking adequate empirical and theoretical insight. Calls for research highlight that "compared to insights on digital technologies, the extant literature provides sparse coverage on theoretical developments or empirical research that can explain the process of digital transformation, such as how transformations become implemented, embedded, integrated, and evaluated in practice" (Carroll et al. 2021 p.1). This further corroborates the emergent nature of the phenomenon and its significance to both academic and practice-based scholarship.

Although more relevant for established organisations having to adapt to remain competitive in the digital age, DT is not exclusive to this type of organisation (Vey et al. 2017; Bresciani et al. 2021a). In today's world no organisation, regardless of its size, industry, or how long it has been in existence is exempt from DT, which highlights the increase in scope and scale of this phenomenon (Vey et al. 2017; Bresciani et al. 2021a). Nevertheless, larger, established organisations face a unique set of challenges (Chanias et al. 2019), not necessarily present in smaller organisations.

The emerging themes amongst recent papers are solidifying DT as a unique phenomenon and drawing clearer delineations with other types of organisational transformation and change (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020; Wessel et al. 2021). The ambiguity over the use of the term *digital transformation* has sparked debates over its legitimacy as a distinct phenomenon (Vial 2019). However, the ambiguity over the term DT does not diminish its significance (Chen and King 2022).

1980s saw the emergence of organisational transformation (OT) literature, which was amalgamated with IT/IS- enabled change in the 1990s, commonly known as ITOT (Besson and Rowe 2012; Hanelt et al. 2020; Nadkarni and Prügl 2020; Wessel et al. 2021). While some researchers argue that DT is an evolution of ITOT (Vial 2019), others see it as a type of ITOT (Taj et al. 2021). Nevertheless, while overlaps do exist between the two phenomena, the underlying assumptions that shaped the discourse on ITOT have shifted with the advancements in digital technologies to reify DT as a distinct phenomenon (Wessel et al. 2021). With recent attempts to provide a clearer delineation between ITOT and DT (Wessel et al. 2021), there are a number of differences between ITOT and DT worth noting.

Firstly, DT encompasses a wider scale and scope of transformation than ITOT. While ITOT in the past was largely driven by managerial intent, DT is driven by trends in the industry and the society at large (Vial 2019; Wessel et al. 2021), driving cultural and economic change (El Sawy

et al. 2016; Hanelt et al. 2020). For example, industry lines are continuing to blur with the emergence of business ecosystems (Svahn 2017; Vial 2019; Hanelt et al. 2020). The rise of the sharing economy has generated a global multibillion dollar market (Teubner and Flath 2019). At the organisational level, DT affects the organisation as a whole, as opposed to certain parts of the organisation, as is often the case with ITOT (Hanelt et al. 2020; Wessel et al. 2021).

Secondly, the unique properties of digital technologies reify DT as a distinct phenomenon (Vial 2019). The nature of digital technologies is inherently different from the past-generation of monolithic, IT systems (Hanseth and Rodon Modol 2021; Schreieck et al. 2021), commonly the subject of ITOT studies (Taj et al. 2021). Digital technologies allow greater reconfigurability, leading to more dynamic behaviour and generativity at unprecedented scales (Yoo 2013). Digital technologies are characterised by embeddedness, connectivity, editability, reprogrammability, communicability, identifiability and associability (Benbya et al. 2020). Their embeddedness is reflected in their increasing intertwinement with material objects, connecting these objects and their users to interrelated socio-technical networks of relations. These complex socio-technical networks drive greater editability by injecting diverse cognitive processes and ongoing adaptations. The separation between hardware and software leads to reprogrammability where different software can enable different functionality in the same hardware. Their communicable property is associated with the infrastructuring of digital technology based on common protocols, which also makes devices easily identifiable through unique addresses. Digital technologies are associable as a result of their shared characteristics which makes emerging patterns detectable across distance and different spheres (Benbya et al. 2020). Indeed, the transformative power of digital technologies lies in their "modular, distributed, cross-functional, and global business processes that enable work to be carried out across boundaries of time, distance, and function" (Bharadwaj et al. 2013a p.472).

Thirdly, digital technologies are also calling the conventional views on strategy into question (Teubner and Stockhinger 2020). Dynamic forms of strategising are now more important than ever before (Chanias et al. 2019; Nadkarni and Prügl 2020), as well as operating models to support new strategic pathways (Berman 2012; Verhoef et al. 2021). The traditional business and IT divide and the continual need for their alignment is now being replaced by a different logic. Technology is no longer playing a subordinate role to business strategy, but becoming the key enabler and influencer of business strategy (Bharadwaj et al. 2013a; Sia et al. 2021; Wessel et al. 2021).

Fourthly, DT is also a much more dynamic process that ITOT and happens at a more rapid rate. New digital technologies are continually being released and as time to market reduces, there is even less time than before to react to market changes (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020). Access to on-demand services offered by cloud technology enable greater flexibility, scale and speed (Battleson et al. 2017). The global pandemic and the need for digitisation has further accelerated this trend (Kudyba 2020). The ability to adapt is now more crucial than ever before. This pace of change alone has forced some organisations out of business over the years (Hess et al. 2016). Agility and adaptability to speed will stand the test for many organisations today (Sia et al. 2021).

Finally, while ITOT maintains and enhances the existing value propositions and organisational identity, DT unlocks the potential for new value creation paths that can lead to entirely new business models and organisational identities (Wessel et al. 2021). Unlike other types of organisational change, DT calls for organisations to rethink their business models, and the operating models to support them (Berman 2012). In the light of new ways of creating and

capturing value, reshaping organisational strategies (Gawer 2021) we must challenge the effectiveness of traditional forms of organisational intelligence and strategy definition (Teubner and Stockhinger 2020). DT allows organisations to challenge the status quo and alter an organisation's deep structure (Baiyere et al. 2020), including making deep changes to its "enterprise technology, structure, identity, value proposition, and business strategy" (Drechsler et al. 2020 p.23).

Although DT is often associated with strategic change (Matt et al. 2015; Chanias et al. 2019), such as creating new digital value propositions, DT also has implications for an organisation's operations, for example by improving efficiency through automation and digitised processes (Vial 2019; Senyo et al. 2021). However, DT has wider implications for operations than improving efficiency alone. Digital technology has the power to transform the very fabric of operations, by leading to new organising logic (Bailey et al. 2019; Baiyere et al. 2020; Sandberg et al. 2020; Pentland et al. 2021). These new forms of organising logic are conducive to new patterns afforded by digital technology (Sandberg et al. 2020). Organisations can no longer rely on either strategic differentiation or operational efficiently (Queiroz et al. 2018), as was the case in the past. Present-day organisations need an ambidextrous ability to simultaneously engage in the exploration of new strategic options and exploitation of existing resources for optimising operational efficiency (Sebastian et al. 2017).

With evidence of DT being a novel phenomenon in its own right, as exemplified by the aforementioned differences between ITOT and DT, we cannot rely on theorisations and established models of the past (Hanelt et al. 2020). Drawing on traditional IS implementation and organisational change literature does not account for the complexity of DT (Carroll and Mc Lafferty 2021). I now discuss the nature of change in DT and the need to challenge the previously established assumptions about IS change.

2.2.2 The Nature of Change in DT

The early literature on organisational transformation distinguishes between incremental and radical change, based on the punctuated equilibrium (PE) models. This particular theory stipulates that periods of stability, marked by incremental change are interrupted by intermittent episodes of radical change (Tushman and Anderson 1986; Gersick 1991). Incremental change transpires as a continuous sequence of smaller, gradual adaptations. This type of change has been described as 'ongoing, evolving and cumulative' (Weick and Quinn 1999 p.375). This is consistent with the representation of DT as a process or a journey, rather than an event (Vial 2019). Radical change, on the other hand is considered episodic and disruptive enough to change the deep structure, or the status quo of an organisation (Lucas Jr and Clemons 2013). Examples of incremental change include making improvements to operational efficiency, as opposed to changing a business model (BM), which would be considered a more radical change (Weick and Quinn 1999; Besson and Rowe 2012). The incremental adaptations are considered emergent, whereas radical change is often viewed as deliberate (Lyytinen and Newman 2008).

Researchers contend that due to the dynamic and generative nature of digital technologies, even episodic change can trigger continuous change. Therefore previous conceptualisations of organisational transformation as punctuated change are being challenged on the basis that the current digital era generates more complexity and ongoing change, hence disruptions are more frequent and not necessarily followed by periods of stability (Hanelt et al. 2020). This is exemplified by an increase in turbulence (Pavlou and El Sawy 2010), such as the current global pandemic (Kudyba 2020).

Moreover, the increasing proponents of the process view (Carroll and Mc Lafferty 2021) are challenging the early discourse on DT that typically involved the assumption of an end-state, depicting transformation in terms of a before and after state (Besson and Rowe 2012). Scholars often use terms such as “digitally transformed” organisation (Sia et al. 2021 p.36) implying an end-state to transformation efforts, or a digital transformation strategy (DTS) implying a temporary organisational initiative (Matt et al. 2015). Beyond initial adoption of digital technologies, studies focusing on normalising DT for longer-term sustainability of the organisation are rare (Carroll and Mc Lafferty 2021).

DT is marked by both emergent and deliberate change (Chanias et al. 2019; Wimelius et al. 2020). In most types of hierarchical organisations today both emergent and deliberate change is present, as an intertwinement of human agency and emergent processes stemming from digital technology (Wimelius et al. 2020). According to institutionalist approaches, agency is often absorbed by the process (Besson and Rowe 2012). Due to the dynamic and often turbulent nature of external environments the organisations operate in, change is inevitable regardless of managerial intention (Hanelt et al. 2020).

DT is also recognised as a multilevel process, and as such cannot be adequately explained with one-dimensional theoretical perspectives (Hanelt et al. 2020). It is a holistic organisational endeavour and as such needs to consider both strategic and operational dimensions in tandem (Wessel et al. 2021). To date, researchers have focused on either the strategic (Matt et al. 2015; Hess et al. 2016; Chanias et al. 2019), or the operational aspects (Tim et al. 2020).

Indeed, to keep up in today’s digital era, organisations need to rethink their value propositions and how to enhance their operating models to realise them (Berman 2012; Baiyere et al. 2020). Yet, studies focusing on both of these dimensions are scarce (Wimelius et al. 2020; Wessel et al. 2021). Moreover, for a deeper understanding of DT dynamics, we need to consider not just the multiple levels of analysis (Wessel et al. 2021), but the interplay between these levels — see for example (Wimelius et al. 2020). Yet, there is a paucity of research exploring how the different levels mutually-influence each other. I now turn my attention to the role of strategy in DT.

2.2.3 The Role of Strategy in DT

Reconceptualising strategy in the digital age is becoming necessary as traditional approaches cease to stay relevant (Teubner and Stockhinger 2020). Technology is no longer playing a subservient role to business strategy, but becoming a key differentiator of value (Bharadwaj et al. 2013a). Strategies inspired by digital technologies aim to redefine an organisation’s value proposition to be able to continually adapt to an ever-changing environment (Sebastian et al. 2017). While these digital business strategies typically describe the desired end-state enabled by digital technologies, a distinct digital transformation strategy (DTS) is focused on the transformation efforts arising from the adoption of digital technologies in an organisation (Matt et al. 2015; Hess et al. 2016). A DTS articulates the coordination, prioritisation and implementation of an organisation’s digital transformation initiatives (Matt et al. 2015; Chanias et al. 2019). Drawing on the wider IS strategic literature, DTS has been conceptualised as the continuous processes and practices of IS strategising involving information technologies (Chanias et al. 2019). IS strategising involves the “deployment, management, and investment in information technology in organisations” (Henfridsson and Lind 2014 p. 12). Departing from a static view of strategy, the process view takes into consideration the temporal succession of events that lead to strategic outcomes (Pettigrew 1992). DT typically requires flexibility for both strategising and strategy implementation (Gregory et al. 2015). Despite much interest in the strategic aspects of DT, we still do not have a clear understanding as to how organisations can leverage DT strategies for growth and scale (Bresciani et al. 2021a).

For success the overall DT strategic endeavours need to be in close alignment with operational and functional strategies (Hess et al. 2016). Beyond its transformative power, DT also has implications for operational efficiency, although this has been explored to a lesser extent (Vial 2019). This is unfortunate because to cultivate innovation, organisations often need to effectively redesign their operations (Mhlungu et al. 2019). DT can help break rigidity and organisational silos for improved structures and processes (Bygstad and Hanseth 2018; Wessel et al. 2021). Improvements in processes can manifest through the integration of business activities and leveraging the available data to make improvements (Berman 2012) — for example through business analytics (Tim et al. 2020). On the other hand, standardising technology can help create a seamless execution of transactions and critical data to ensure the "efficiency, scalability, reliability, quality and predictability of core operations" (Sebastian et al. 2017 p.201).

Digital technologies can enable more than just an increase in operational efficiency, but transform the very fabric of organising (Sandberg et al. 2020; Bogers et al. 2021). While organisational transformations of the past have served to enhance existing processes, currently emerging digital technologies have greater implications than automating and informating alone. They are essentially altering "how, when, and where work gets done, as well as by whom and for whom" (Bailey et al. 2019 p.643). Next, I turn my attention to the drivers of DT.

2.2.4 Drivers of DT

Digital technology can be both a source of disruption and opportunity in relation to DT (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020). A number of exogenous and endogenous drivers of DT can be gleaned from the literature. Exogenous drivers can broadly be attributed to the wide-scale digitalisation, the changing nature of competitive landscapes, shifts in industries and markets and consumer expectations (Verhoef et al. 2021).

The wider societal and economic changes can be ascribed to the rise of digitalisation, not to be confused with the process of digitisation (Tilson et al. 2010). *Digitisation* is the process known as "the encoding of analogue information into digital format" (Yoo et al. 2010 p.725). Digitalisation, inspired by the technical process of digitisation refers to a "socio-technical process of applying digitising techniques to broader social and institutional contexts that render digital technologies infrastructural". This is causing a more profound impact on multiple levels of society (e.g. for individuals, groups, organisations and markets) (Tilson et al. 2010 p.2). As such, digital technologies have been deemed to have a more transformational effect than other technological inventions of the past, as they spur complex socio-technical systems, arising from the intertwining between human agency, digitisation and material artefacts (Benbya et al. 2020). Digital technologies, such as those under the acronym of SMACIT (social, mobile, analytics, cloud and the internet of things – IoT) are considered the impetus behind DT, as organisations forge new value creation pathways in the digital era (Vial 2019). The plethora of these technologies and their wide-scale adoption has given rise to e-commerce, amounting to trillions of dollars of revenue (Verhoef et al. 2021).

The nature of competition is changing with new models of market dynamics emerging, ranging from competition, cooperation and coopetition (Cozzolino et al. 2021). The roles of agents and modes of competition are not necessarily fixed, and are continually coevolving. For example, agents can assume the dual roles of being both a consumer and a collaborator, or the relationship between agents can change from a collaborative one to competitive one and vice versa (Gawer 2014). To that end, market logic is shifting from service exchanges to value co-creation with multiple parties (Lusch and Nambisan 2015).

The shifts in industries and markets is reflected by the emergence of business ecosystems (Jacobides et al. 2018; Cennamo et al. 2020). We are witnessing a disruption and transformation of traditional industries by digital entrants (Vey et al. 2017; Verhoef et al. 2021). Indeed, the world's most successful organisations in 2018 were digital companies including Apple, Alphabet, Microsoft, Amazon and Facebook (Verhoef et al. 2021). For example, industries like transport, accommodation and music, have been transformed by companies such as Uber, Airbnb and Spotify (Bresciani et al. 2021a). Similarly the online platform Alibaba has disrupted the financial (Sia et al. 2021) and retail markets (Tan et al. 2015). The convergence of industries is further reflected in the collaboration between manufacturers (e.g. automotive) with digital partners in order to augment physical products with digital capabilities (Svahn 2017; Schreieck et al. 2022). This is forcing organisations to offer new digital value propositions (Vial 2019; Correani et al. 2020), enter new markets to remain competitive (Baiyere et al. 2020; Tim et al. 2020), or take on a more proactive role by disrupting industries and getting the first mover advantage (v. Alberti-Alhtaybat et al. 2019). Hence, the ability to sense new competitors is diminishing, as new entrants emerge from unexpected directions and industries (Vey et al. 2017; Chanias et al. 2019).

Drastic changes in consumer behaviour are impelling organisations to engage with customers in different ways and provide omni-channel experiences (Yeow et al. 2018; Nadkarni and Prügl 2020). Hyper-personalisation is increasingly required to offer superior customer experience and service through the use of big data, for example (Jain et al. 2021). Consumers are increasingly presented with new options, and their buying behaviour is influenced by information and advice shared by others through channels such as social media. Traditional marketing methods are therefore having less influence (Berman 2012). Moreover the consumerisation of IT as a result of changing consumer expectations is driving a democratisation of IT in organisations (Gregory et al. 2018). In the more recent times, external events like COVID-19 have further accelerated a need for DT due to a growing dependence of digital technologies, radically shifting the nature of work (Madsen 2020).

These wider external shifts are behind some of the observed endogenous drivers such as the desire to improve customer engagement and experience (Correani et al. 2020), engage with external partners through an ecosystem (Svahn 2017) and open new digital sales channels (Yeow et al. 2018). Digital technologies are also attractive for achieving cost economy, by redesigning the nature of work and reducing supply chain costs (v. Alberti-Alhtaybat et al. 2019). Other observed internal drivers include the need to improve processes (Senyo et al. 2021) and standardise technology (Vestues and Rolland 2021).

In short, the wider societal drivers of DT spurred by the rise of digitalisation, as well as an internal need to optimise operations are impelling organisations to engage in DT initiatives. The drivers can be both a source of disruption and opportunity for organisations. Next, I turn to the different perspectives on DT discussed in the literature.

2.2.5 Perspectives on DT

The emerging discourse on DT continues to attract extensive and ongoing scholarly interest from multiple perspectives and disciplines, such as IS (Wessel et al. 2021) and business management (Bresciani et al. 2021a; Kraus et al. 2022), with recent attempts to generate a multidisciplinary discourse (Verhoef et al. 2021). Three broad perspectives can be gleaned from the literature on DT. These are the organisational, human-centric and technology-driven perspectives, summarised in Table 3 below. This thesis falls in the technology-driven category, yet encompasses a broader socio-technical view. With this I acknowledge the nature of DT in an organisational context as socio-technical in nature, due to a deep intertwinement between human agency and digital technologies (Wimelius et al. 2020).

The dominant facets explored in the literature adopting the organisational perspective include both strategic and operational aspects (Nadkarni and Prügl 2020). There is a seemingly greater emphasis on the strategic aspects (Matt et al. 2015), with scholars recently highlighting the importance of exploring both strategic and operational dimensions (Wessel et al. 2021). The strategic stream has explored new digital strategies (Sebastian et al. 2017), including new specific DT strategies (Hess et al. 2016), business model innovation (v. Alberti-Alhtaybat et al. 2019) and new ways of value creation and capture (Leijon et al. 2017; Nambisan et al. 2019). The operationally-focused stream has explored the transformation of business processes (Wamba et al. 2018; Enkel et al. 2020), routines (Taj et al. 2021), capabilities (Li et al. 2018) and structures (Resca et al. 2013; Schwer and Hitz 2018), including changes to culture (Karimi and Walter 2015) and new ways of working (Dery 2017).

The human-centric perspective on DT has focused on leadership and other capabilities required in the digital age (Nadkarni and Prügl 2020). For instance, Li et al. (2018) found managerial cognition renewal (challenging old mindsets) and managerial social capital development (engaging in an ecosystem) to be important capabilities for a DT. Others highlight the need for new leadership competencies (El Sawy et al. 2016) and the emergence of new and dedicated digital roles, such as Chief Digital Officer (CDO) (Tumbas et al. 2018; Kraus et al. 2021) required in the digital age.

The technological perspective has explored the way adoption and use of technology attributes to business value (Verhoef et al. 2021). Investment into technology has been considered crucial for realising business benefits and to improve organisational performance (Richardson et al. 2014; Kraus et al. 2021). There is a long-standing recognition that information systems are a key asset in DT due to "the disruptive nature of IT innovations, the deep digitalisation of business and their cross-organisation and systemic effects, notwithstanding the amounts of investments in enterprise systems" (Besson and Rowe 2012 p. 104). As business infrastructure increasingly becomes digital there is greater integration between products, services and organisational processes (Bharadwaj et al. 2013a).

The advent of digital technologies has heightened the value of technology due to their generative nature and a more transformational power than previous generations of IT systems (Yoo et al. 2010; Benbya et al. 2020). As such, DT does not just change a technology, but also its use (Wimelius et al. 2020). This is leading to fundamentally different strategies, processes, capabilities, products, services and inter-organisational relationships (Bharadwaj et al. 2013a)

Much of the ability of the organisation to continuously evolve hinges on having flexible IT systems (Cha et al. 2015). The proliferation of cloud technology has transformed how businesses operate, accelerating their innovative potential (Battleson et al. 2017; Vey et al. 2017; Benlian et al. 2018). Some examples of technology-enabled DT are: changes in technology affordances (Tim et al. 2020), technology renewal (Wimelius et al. 2020), operational and strategic uses of technology (Sebastian et al. 2017; Sia et al. 2021), transformation of business models through technology (v. Alberti-Alhtaybat et al. 2019), leveraging technical capabilities in ecosystems (Li et al. 2018) and establishing new, more democratised technical governance structures in organisations (Gregory et al. 2018).

Table 3 — Different perspectives on DT extrapolated from the literature

Perspective	Description	References
Technology	Changing affordances, technology renewal, operational and strategic uses of technology, transformation of business models through technology, technical capabilities, new governance models	(Matt et al. 2015; Sebastian et al. 2017; Gregory et al. 2018; Li et al. 2018; Tim et al. 2020; Wimelius et al. 2020; Sia et al. 2021)
Organisational Aspects	Transforming business processes and organisational structures, new digital strategies, culture changes and organising logic	(Bharadwaj et al. 2013b; Resca et al. 2013; Karimi and Walter 2015; Matt et al. 2015; El Sawy et al. 2016; Hess et al. 2016; Sebastian et al. 2017; Schwer and Hitz 2018; Tumbas et al. 2018; Wamba et al. 2018; v. Alberti-Alhtaybat et al. 2019; Baiyere et al. 2020; Enkel et al. 2020; Hanelt et al. 2020; Tim et al. 2020; Sia et al. 2021)
Human factors	Roles and competencies	(Matt et al. 2015; El Sawy et al. 2016; Hess et al. 2016; Tumbas et al. 2018; Sia et al. 2021)

The types of digital technologies explored in the context of DT have included cloud computing (Battleson et al. 2017), social media (Dery 2017), AI (Rodgers et al. 2021), IoT (Haaker et al. 2021) and big data and analytics (Tim et al. 2020). However, digital platforms as an emerging type of digital technology has not been explored to a great extent in the context of DT (Vial 2019). This is unfortunate because digital platforms as a new open and generative type of digital technology enable evolving affordances (Bonina et al. 2021). This makes them highly relevant for the study of DT. Next, I turn to the mechanisms of DT.

2.2.6 Mechanisms of DT

Our understanding of IS change has been limited by variance-models prevalent in the 1990s, that have largely disregarded the mechanisms of change (Vial 2019). With increasing recognition that DT is a continuous process, and not a state, new lenses are required to capture its complex socio-technical dynamics (Hanelt et al. 2020; Carroll and Mc Lafferty 2021). DT is establishing new processes and mechanisms with implications for organisational structures and ways of doing business (Kraus et al. 2022). Mechanisms include “complex, multi-party processes, sequences of actions and events triggered by digital affordances” (Urbinati et al. 2021 p.2).

To explicate how the overall DT process unfolds we need to turn our attention to these underlying mechanisms, that lead to change (Besson and Rowe 2012; Hanelt et al. 2020; Markus and Rowe 2021). Although some scholars imply the deliberate build of mechanisms (Bygstad 2021), in reality mechanisms are not always deliberate, but often emergent in nature (Volberda and Lewin 2003). This means that change as a process cannot always be "intentionally designed and executed" (Besson and Rowe 2012 p.114).

To date, empirical studies exploring mechanisms of DT are scarce, or inferred from prior literature (Hanelt et al. 2020; Urbinati et al. 2021). Theorisation of mechanisms in the context of DT is also very limited (Sandberg et al. 2020). However, in today's highly turbulent environments, it becomes crucial to unearth the mechanisms of DT that can "enable repeatable, continuous adaptation" (Vial 2019 p.133).

Although dynamic capabilities have been explored to some extent (Karimi and Walter 2015; Li et al. 2018; Ghosh et al. 2022), the mechanisms of DT remain an under-researched area. Yet, to understand how the higher-level dynamic capabilities emerge, it is crucial to have an understanding of the micro-level mechanisms that contribute to their formation (Bygstad 2021). These mechanisms form the micro-foundations capable of explaining how DT unfurls in practice (Vial 2019).

Through inference from the literature, three broad categories of mechanisms of DT have emerged: innovation, integration (Hanelt et al. 2020) and orchestration (Urbinati et al. 2021). While innovation mechanisms are concerned with the novel use of resources, processes and capabilities, integration mechanisms could help explain how this innovation is integrated with the current resources, processes and capabilities (Hanelt et al. 2020). The theme of integration fits with the wider theme of ambidexterity, as the ability to contemporaneously engage in novelty and optimisation of existing resources (Sebastian et al. 2017). Orchestration mechanisms are concerned with the way organisations manage and coordinate digital and human resources (Urbinati et al. 2021)

The term 'mechanism' is often used loosely in the literature without a clear definition (Mulyana 2021) or being made the objective of the study (Resca et al. 2013). In this thesis, I define a mechanism as the embodiment of a succession of events and the relationships between them (Hedström and Swedberg 1998). I acknowledge the socio-technical nature of a mechanism as the interaction between social and technical components (Henfridsson and Bygstad 2013).

Some studies frame the interplay between paradoxical tensions as mechanisms (Wimelius et al. 2020). This can be problematic, as paradoxical tensions are ultimately irreconcilable, need to be managed and can ultimately lead to different outcomes then those originally envisaged, resulting in greater inefficiency. In other words, while these dynamics illuminate the challenges associated with DT, they do not necessarily demonstrate through which mechanisms DT can be successfully achieved. This creates a dissonance in the literature, creating ambiguity around mechanisms of DT. With DT failure becoming a growing concern, due to various misalignments (e.g. contentions between planned and actualised outcomes) (Correani et al. 2020), it becomes even more crucial to understand mechanisms, whether outcomes are successful or not.

Prior work on mechanisms of DT focused on small and medium-sized enterprises (SMEs) (Mandviwalla and Flanagan 2021; Zhang et al. 2022) and new ventures (Ye et al. 2022). Beyond the topic of DT, studies on mechanisms of digital infrastructures (DIs) also focused on nascent industries (Henfridsson and Bygstad 2013; Huang et al. 2017). These insights while useful cannot be readily applied in the context of large, complex organisations undergoing a DT.

2.2.7 Summary

To sum up this section, DT is an emerging and timely phenomenon, mostly relevant, but not exclusive to incumbent organisations, as they seek to adapt to the wider societal impacts of digitalisation and a need to boost their own performance. The wide-spread digitalisation has recently only been accelerated by the COVID-19 pandemic. The unprecedented scale of change brought on by COVID-19 continues to hasten the speed of DT with profound impacts on organisations worldwide. With the external environment being in a constant state of flux, organisations are forced to continually react and adapt.

Researchers contend that DT is a continuous process and not a desired end-state. It is also a multilevel phenomenon. As such, single lens perspectives will not fully capture the complexity of its dynamics. Moreover, greater clarity is required as to the mechanisms of DT that may contribute to higher-order outcomes or capabilities either directly or indirectly.

While DT can be approached from different perspectives, it is recognised that digital technology plays a fundamental role in the process. Devising strategies appropriate for the increasing reliance on digital technologies is becoming a managerial imperative. A particular type of digital technology with implication for DT but explored to a lesser extent are digital platforms. The next section of the literature review is dedicated to digital platforms.

2.3 Digital Platforms

Digital platform literature has been burgeoning for over a decade (Tiwana et al. 2010; Yoo et al. 2010). Although some of the most successful companies in the world (e.g. Facebook and Google) are platform companies, many incumbent organisation are leveraging digital platforms to improve their performance (Constantinides et al. 2018). The unique properties of digital technology make digital platforms distinct from other conceptualisations of platforms in the past (de Reuver et al. 2017). Digital platforms are open, generative systems enabling evolving affordances (Lusch and Nambisan 2015; Bonina et al. 2021).

2.3.1 Perspectives and Dimensions of Digital Platforms

Despite ongoing interest in digital platforms, we are still lacking conceptual clarity regarding this phenomenon (Bartelheimer et al. 2022). Three dominant perspectives can be gleaned from the literature on digital platforms: engineering, economic and organisational perspectives (Rolland et al. 2018). It can be argued that all platforms possess similar structural characteristics, consisting of a core component and a set of auxiliary interrelated components (Baldwin and Woodard. 2009).

The engineering design perspective stream portrayed digital platforms as technological architectures characterised by modularity and component reuse and recombination (Baldwin and Woodard. 2009; Gawer 2014; Henfridsson et al. 2014). It is rooted in physical product design and software design (Rolland et al. 2018). Viewing the platform as a set of modular components, interacting through interfaces, this stream of research was heavily focused on the product design and achieving economies of scale and scope (Baldwin and Woodard. 2009; Gawer 2014). This modular structure reduces the complexity by breaking the system into loosely-coupled subcomponents resulting in easier product design (Schilling 2000). Alternatively researchers also focused on third-party complementors in platform ecosystems (Ghazawneh and Henfridsson 2013; Spagnoletti et al. 2015; Schreieck et al. 2021) and governance of such platform ecosystems (Wareham et al. 2014; Schreieck et al. 2016; Huber et al. 2017).

The economic perspective largely referred to platforms as “two-sided markets”, “multi-sided markets”, “multi-sided platforms” or “multi-sided markets” (Rochet and Tirole 2003; Gawer and

Cusumano 2014). The terms “market”, “platform” or “ecosystem” have often been used interchangeably in the literature (Tan et al. 2015). The conceptualisation of a digital platform as a marketplace therefore includes two or more sides and a platform that connects the different parties (Rochet and Tirole 2003; Eisenmann et al. 2011; Gawer 2014). Examples of such platform marketplaces include eBay and Alibaba. The role of the platform is to act as an intermediary between supply and demand and manage market dynamics (Thomas et al. 2014). Often characterised by network effects, the benefit to one side of the platform, depends on the size of the other, such as on gaming platforms for example, where the incentive to build games increases as the user base grows (Gawer 2014). Pricing structures, revenue-sharing and competitive strategies have been the focus of economic research on platforms (de Reuver et al. 2017).

The third perspective is referred to as the organisational perspective. There are two observable standpoints in this stream of research — a metaphoric conceptualisation of a platform as an organisation, and the role of digital platforms in organisational contexts. The metaphoric representation of platforms as organisations refers to these platforms as: *organisations as platforms*, *platform organisations* or *meta-organisations* (Resca et al. 2013; Gawer 2014; Thomas et al. 2014). This view recognises the ability of the organisation to re-arrange processes, resources and business units to align with the strategic direction of the organisation to attain a competitive advantage (Resca et al. 2013; Thomas et al. 2014). The concept of meta-organisations often spans the boundaries of a single organisation (Gawer 2014).The alternative view, and a much less researched one is the focus on leveraging digital platforms in organisational contexts, focusing on the socio-technical aspects of digital platforms in organisations (Rolland et al. 2018). This steam of research often focuses on the replacement of legacy systems in favour of digital platforms (El Sawy et al. 2016; Alt 2022). This study adopts this latter perspective on digital platforms as socio-technical phenomena in organisations. Table 4 provides a summary of the three dominant perspectives in digital platform literature.

Table 4 — Perspectives on digital platforms in the literature

Perspective	Description	References
Engineering	A technical system based on a modular architecture, characterised by a core, a set of peripheral components and interfaces that enable communication between them. Building product derivatives is afforded through component reuse and recombination.	(Baldwin and Woodard. 2009; Tiwana et al. 2010; Gawer 2014; Gawer and Cusumano 2014)
Organisational	Referred to as “organisation as a platform” or “platform organisation”. This is a metaphorical representation of an organisation and its underlying technology as a platform. As a “meta-organisation” construct it focuses on intra-organisational relationships and is synonymous with the word “ecosystem”.	(Resca et al. 2013; Gawer 2014; Thomas et al. 2014; Hänninen et al. 2018)

	A socio-technical perspective focused on the use of digital platforms within organisational contexts.	(Rolland et al. 2018; Törmer 2018; Vestues and Rolland 2021)
Economic	A digital marketplace connecting two or more groups, characterised by network effects, and often referred to as two-sided or multi-sided platforms.	(Rochet and Tirole 2003; Eisenmann et al. 2011)

This section demonstrated the dominant perspectives on digital platforms in the literature. The organisational perspective, prioritising the socio-technical aspects of digital platforms remains a neglected area of research by scholars. Yet, it is recognised as an important research area as more organisations move on from legacy systems to digital platforms. Next, I discuss the different classifications of digital platforms.

2.3.2 Classifying Digital Platforms

The extant literature has illuminated a number of dimensions and types of digital platforms over the years (Gawer and Cusumano 2014; Asadullah et al. 2018a; Bonina et al. 2021). According to the organisational boundary, digital platforms can be divided into internal, supply-chain and industry platforms, commonly referred to as ecosystems (Gawer and Cusumano 2014). Internal digital platforms, which are the focus of this research, operate within a single organisation's boundaries. Supply-chain platforms operate between an organisation and its supply network — common in the manufacturing industry, such as the automotive or the consumer electronic industries (Gawer and Cusumano 2014). Partners in the supply-chain network contribute to the final product to achieve economies of scale (Gawer and Cusumano 2014). Platforms operating within ecosystems extend value co-creation beyond a single organisation's boundaries (Gawer 2014). Table 5 and Figure 3 below capture these three types of platforms along with examples from the literature of organisations utilising them.

Table 5 — Classifying digital platforms based on organisational boundary

Organisational boundary	Examples from the Literature	References
Internal digital platforms	Lego, St Jude Children's Research Hospital, ABB (process automation manufacturer), European bank (pseudonym), Scandinavian Media company (pseudonym)	(Richardson et al. 2014; El Sawy et al. 2016; Schreieck and Wiesche 2017; Gregory et al. 2018; Rolland et al. 2018; Törmer 2018)
Supply-chain platforms	Renault–Nissan (automotive manufacturing), Boeing (aerospace manufacturing) and ABB (process	(Gawer 2014; Sandberg et al. 2020; Jovanovic et al. 2022)

	automation manufacturer)	
Platform ecosystems	Apple, Alibaba, KakaoTalk (mobile instant messaging application, launched by KakaoCorp, Android, Amazon	(Boudreau 2012; Ghazawneh and Henfridsson 2013; Tan et al. 2015; Staykova and Damsgaard 2016)

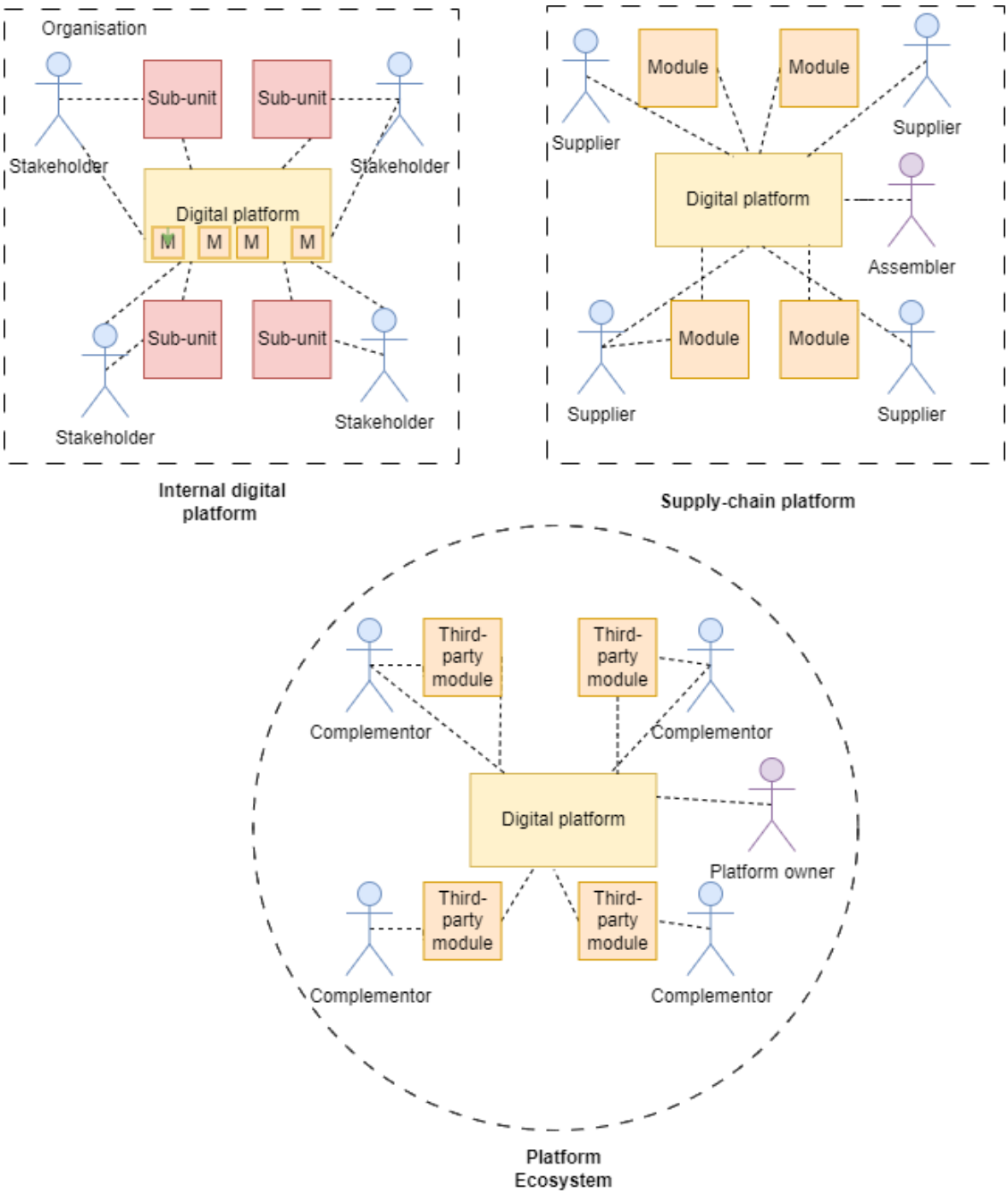

Figure 3 — Classifying digital platforms according to organisational boundary

Internal digital platforms have been largely neglected in the extant literature, although there is growing evidence of their value for organisations (Gregory et al. 2018). Internal digital platforms exhibit entirely different dynamics to platform ecosystems and are thought to be more complex, due to the more heterogeneous actors they support such as employees, business partners and customers (Törmer 2018). With evidence of such platforms flourishing in traditional industries such as finance and health, researchers are called to broaden the scope of digital platform research (de Reuver et al. 2017). Moreover, it can be argued that the progression of a digital platform's evolution towards an external ecosystem starts with an internal digital platform (Jovanovic et al. 2022). Although often neglected in the literature, ecosystems can remain internal to an organisation (Hein et al. 2019). An internal ecosystem "consists of actors, business processes, technology and other resources within an organisation, coevolving to obtain organisational goals" (Wang 2021 p.401).

A very fragmented and limited view of the purpose of internal digital platforms can be gleaned from the literature — see Table 6. The research has predominantly focused on product and innovation platforms (Gawer and Cusumano 2014; Sedera et al. 2016; Sebastian et al. 2017; Törmer 2018; Jovanovic et al. 2022). Sometimes referred to as enterprise platforms, such as Salesforce, SAP and Siemens Mindsphere, they are still mostly considered in the context of innovation (Bonina et al. 2021; Rolland 2021). However, it is recognised that organisations can "build a platform not just of products but of digital capabilities used throughout the organisation to support its different functions" (Yoo et al. 2012 p.1400). Other uses of internal digital platforms include crowdsourcing (Zuchowski et al. 2016) and knowledge-sharing platforms, such as enterprise social media platforms (Dery 2017; Hossain and Lassen 2017), although academic studies on such platforms are rare.

Table 6 — Different types of internal digital platforms according to the literature

Type of platform	References
Product and innovation platform	(Gawer and Cusumano 2014; Richardson et al. 2014; El Sawy et al. 2016; Gregory et al. 2018; Törmer 2018; Sandberg et al. 2020)
Crowdsourcing platform	(Zuchowski et al. 2016)
Enterprise social media platforms	(Aral et al. 2013; Dery 2017; Rahrovani 2020)

Although supply-chain platforms are considered a "special case of internal platform" (Gawer and Cusumano 2014 p. 419), they are idiosyncratic to manufacturing industries (Gawer and Cusumano 2014). As such, their dynamics and purpose are different to internal digital platforms presented in Table 6**.** Their focus is primarily on product production (Thomas et al. 2014). Hence, we can conclude that the product innovation and production perspective is the dominant perspective in the literature on internal digital platforms. As such, we have a very limited understanding of other uses and affordances enabled by internal digital platforms.

Cloud computing has caused a dramatic shift from IT-as-a-product to IT-as-a-service, with cloud solutions increasingly becoming the infrastructure tenets for organisations, changing the way organisations operate, connect and collaborate (Benlian et al. 2018). Cloud-based digital platforms such as Salesforce and Microsoft Office 365, SAP, ServiceNow, Confluence and

JIRA are increasingly being used in organisations for their work processes and practices (Rolland 2021). These platforms have wider-ranging implications than innovation alone, with the ability to influence and change work processes, skills and organisational structures (Hanseth and Rodon Modol 2021).

Digital platforms operating in platform ecosystems, such as those of Apple and Google have dominated digital platform literature since its inception (Ghazawneh and Henfridsson 2011; Tilson et al. 2012). This stream of literature has focused on both the platform owner perspective (Tan et al. 2015; Ter et al. 2018), as well as that of the complementors (Selander et al. 2013; Qiu et al. 2017; Schreieck et al. 2021). Most of the identified dimensions for classifying digital platforms pertain to this stream of literature. Some of these dimensions include strategic dynamics, IP ownership, governance and purpose.

According to strategic dynamics, we can classify digital platforms into competitive (e.g. Alibaba) (Tan et al. 2015), collaborative (e.g. Wikipedia) (Asadullah et al. 2018a) and cooperative (Zhu and Marjanovic 2021) platforms. Agents' roles on these platforms are not necessarily fixed and continually coevolve (e.g. between competitor and collaborator) (Gawer 2014). In the recent times we are witnessing the emerging dynamic of coopetition, instigated by the integration of cooperation and competition to create a new type of strategic pathway (Pellizzoni et al. 2018).

The IP ownership dimension dichotomises digital platforms into proprietary and open-source platforms (Economides and Katsamakas 2006; Asadullah et al. 2018b). It is however recognised that nuances exist between the two ends of the continuum (Nicolescu et al. 2019). Open-source platforms relinquish control of their intellectual property rights, as opposed to proprietary platforms that typically retain control of the core of their platform (Boudreau 2010), but can be opened partially, through the provision of boundary resources (Karhu et al. 2018).

Similarly, according to the governance dimension digital platforms can be divided into open and closed types, with variations in between (Boudreau 2010). Open platforms rely on lax governance structures, empowering third-party contributors by giving them greater autonomy. Closed governance regimes, on the other hand, are marked by tighter control by the platform owner over the development of complementary innovations (Karhu et al. 2018). Governance in partially open platforms is a more complex process requiring greater precision around the use of property rights (Boudreau 2010).

According to their purpose, platforms in such ecosystems have been broadly classified into innovation and transaction platforms. The role of the former is commonly associated with third-party contributions that extend the functionality of the core platform (e.g. Android and iOS) (Koskinen et al. 2018; Bonina et al. 2021). The role of the latter is to facilitate transactions or exchanges between various parties (e.g. Facebook).

In sum, internal digital platforms remain an under-explored area of research to date. However, based on the underlying assumption that all platforms are structurally the same, we could expect similar benefits to manifest for internal digital platforms (Baldwin and Woodard. 2009). We know very little about how digital platforms shape organisational contexts and end-user activities (Vestues and Rolland 2021). As such, broadening the scope of digital platform research is required for a greater understanding of this phenomenon and its different dynamics in different contexts (de Reuver et al. 2017). I now discuss the technical characteristics of digital platforms and their underlying architecture.

2.3.3 Architecture of Digital Platforms

The engineering perspective has informed our understanding of the architectural characteristics of digital platforms, which are related to software architectures. A digital platform's evolution and generative potential is contingent on its technical architecture (Rolland et al. 2018). A digital platform consists of an "extensible codebase" consisting of a core component and a set of modules interlinked through interfaces. The modules compliment and extend the functionality of the digital platform (Tiwana et al. 2010 p.675). A platform architecture is known as the conceptual blueprint for organising platform components (Tiwana et al. 2010).This modular design is based on the principle of loose-coupling and is a contrast to tightly coupled systems, without standard interfaces. In tightly coupled or integral systems, a change in a component can have unanticipated, and often adverse impacts on the rest of the system (Yoo et al. 2012).

The platform core typically exhibits low variety and as such provides stability longer-term. The peripheral modules, on the other hand, exhibit high variety due to their loose-coupling and standardisation of interfaces. This engenders a high degree of autonomy, where changes in a module do not cause a cascading effect on others. The benefits of modularity include re-use and re-configuration of modules, leading to economies of scale, scope and substitution (Baldwin and Woodard. 2009; Tiwana et al. 2010). Digital platforms' modular design allows for an ease of integration between modules. While systems integration has been a topic of much interest to date, the ability of the platform to be dissembled into subcomponents without impacting the rest of the platform is also an important factor to consider for its evolution. Integration and decomposition should not be assumed to be mutually dependent (Agarwal and Tiwana 2015). To date, there has not been much research focusing on the concept of decomposition.

The concept of modularity has been explored extensively in the literature pertaining to IS design and product development (Benbya and McKelvey 2006a). Scholars have argued that a modular design gives the digital platform the ability to evolve (Tiwana et al. 2010). In contrast, others have argued that it is generativity that gives digital platforms their perpetually evolving traits. These traits include reprogrammability, data homogenisation, and self-organising behaviour. These traits are different from modular systems, which exhibit these characteristics to a much lesser degree (Yoo et al. 2012; Yoo 2013).

Whilst conventional modular architectures are restricted by their contextual boundary, features of digital technology make these boundaries more fluid and adaptable to changing contexts. (Yoo et al. 2010). Sub-components in modular architectures are usually product-specific, designed upfront and extended through standardised interfaces, whereas in generative systems modules emerge without knowing how they will fit into the whole (Yoo 2013). To that end, digital technologies, including digital platforms are characterised by layered modular architectures including devices, services, networks and content. This allows for the separation of software and hardware (reprogrammability), separation between data and hardware (homogenisation of data), and the generation of positive network effects (self-reinforcement) (Yoo et al. 2010).

It is therefore generativity, more than modularity that gives the platforms the ability to evolve. The recombination of components and layers affords new permutations to spring up and renders digital platforms perpetually incomplete (Yoo 2013). The boundaries of the architecture continually change in response to extending the technical functions and social reconfigurations (Hanseth and Rodon Modol 2021). Hence, generativity leads to more dynamic configurations and behaviour that are a stark contrast to past-generations of systems with clearly defined boundaries. A number of scholars have expressed concern over a lack of

understanding of the technical and architectural traits of digital platforms (Tiwana et al. 2010; Jovanovic et al. 2022). To that end, to understand digital platform evolution we must devote greater focus to its underlying architecture. In this way, there is an opportunity to bring digital platforms to the forefront of our theorising (Tiwana et al. 2010).

Digital platforms are often discussed in tandem with digital infrastructures (DIs). DIs are "the computing and network resources that allow multiple stakeholders to orchestrate their service and content needs" (Constantinides et al. 2018 p.381). Examples of DI include the internet, mobile devices and data centres (Constantinides et al. 2018). The binding characteristics of digital platforms and DIs are their shared nature, heterogeneous social and technical dimensions and a path-dependent evolutionary trajectory (Hanseth and Lyytinen 2010). However, there are some fundamental differences that set digital platforms apart from their more complex kin — mainly their organising logic and control mechanisms. Digital platforms are governed by architectural standards and centralised control. DIs on the other hand are more open, distributed in nature, and evolve more organically (Hanseth and Lyytinen 2010). Consequently, digital platforms, can spur and be cultivated on top of digital infrastructures (Hanseth and Lyytinen 2010; Constantinides et al. 2018; Rolland et al. 2018). Their socio-technical complexity is marked by the scalability of evolving IT capabilities and user needs (Hanseth and Lyytinen 2010). The platform architecture needs to accommodate not just the growing variety of modules (Tiwana et al. 2010), but the socio-technical entanglements of platform modules and the socially-assigned affordances. The inherent IT capabilities embedded in the platform are unlocked by stakeholders using the modules in a given context (Hanseth and Lyytinen 2010; Spagnoletti et al. 2015).

In sum, while digital platforms are bound by laws of modularity, arguably they are not merely modular systems. The inherent generativity afforded by digital technologies gives digital platforms greater scope and scale for evolution (Yoo 2013; de Reuver et al. 2017). Generativity can spawn unknown and unforeseeable permutations continually, rendering digital platforms perpetually incomplete (Yoo 2013; Henfridsson et al. 2014). To that end, digital platforms are open and evolvable systems able to continually adapt to keep organisations in sync with environmental demands (Agarwal and Tiwana 2015; Benbya et al. 2020). While modularity has been discussed extensively in the context of digital platforms, the concept of decomposition has not received as much attention to date (Tiwana et al. 2010). Next, I discuss the governance of digital platforms.

2.3.4 Governance of Digital Platforms

According to the "mirroring hypothesis", the digital platform architecture reflects its governance (Hanseth and Rodon Modol 2021). Platform governance is defined as "who makes what decisions about a platform" and is crucial to understand in the context of the evolution of the digital platform (Tiwana et al. 2010 p.679). Research on governance of platform ecosystems has provided extensive insight over the years (Tiwana 2014). A major theme in this stream of research has been the management of boundary resources by governing the relationship between the platform owner and third-party complementors (Karhu et al. 2018). However, this stream of research does not fit the governance of internal digital platforms, which typically rely on managerial authority and hierarchical structures (Gawer 2014). Whilst attempts have been made to study governance of internal digital platforms, such as through democratised governance regimes (Gregory et al. 2018), there is still a lack of clarity as to how governance influences the evolution of an internal digital platform over time. There is also contention regarding decentralised governance (Gregory et al. 2018) and centralised governance structures (Törmer 2018). Other examples include research on internal digital platforms in

manufacturing industries that eventually lead to more open regimes and ecosystem settings, hence focusing more on the inter-organisational dynamics (Svahn 2017).

Managing digital platforms, in the light of these paradoxes becomes an important endeavour longer-term. For example, one of the manifested paradoxes can be the tension between digital options and digital debt. The digital options afforded by the generativity of digital platforms may be constrained by the accumulated digital debt of an organisation's socio-technical arrangements, which makes changes costly and complex. History and path dependencies imposed by the legacy landscape can encumber the realisation of digital options, but by the same token digital options can raise digital debt (Rolland et al. 2018). Striking the right balance of governance can therefore seem like an elusive goal, referred to as the "Goldilocks Governance Problem" (Tiwana et al. 2010 p.679). The mirroring hypothesis is increasingly challenged considering that digital platforms afforded by digital technology can lead to more malleable organisational forms (Constantinides et al. 2018). Next, I present a brief summary of this section.

2.3.5 Summary

A number of gaps can be gleaned from the emerging stream of literature on digital platforms. Despite growing interest in the phenomenon, since Tiwana's et al. (2010) seminal work, digital platform literature has been dominated by platforms ecosystems (such as those of Apple and Amazon). This stream of literature has extensively focused on managing the relationships between the platform owner and the third-party contributors (Tan et al. 2015; Schreieck et al. 2021).This leaves the intra-organisational perspective, along with its own structures and complexities (such as the effect of legacy systems on platform evolution) largely neglected (Vestues and Rolland 2021).

Internal digital platforms within the boundaries of a single organisation have been largely overlooked in the extant literature. However, internal digital platforms are often predecessors to more open and externalised ecosystem models (Jovanovic et al. 2022). There is growing evidence that both incipient (Shi et al. 2020) and established organisations (Richardson et al. 2014; Törmer 2018) are deriving value from these technologies, and in fact consider digital platforms an essential ingredient to thrive in the new digital age.

The scarce literature on internal digital platform provides a very fragmented view. Empirical studies to date have mainly focused on product platforms and innovation (Gawer and Cusumano 2014; Sandberg et al. 2020). Yet, implications of digital platforms extend beyond innovation alone. As such, we must turn our collective attention to internal digital platforms, and in particular unearth new types of internal digital platforms to further elucidate their different purposes.

Numerous scholars have expressed a concern over the lack of focus on the technical aspects of digital platforms (Tiwana et al. 2010; Jovanovic et al. 2022). Architecture of internal digital platforms and their subsequent governance structures, particularly in incumbent organisations are likely to be more complex (Bygstad and Øvrelid 2020) than that of platform organisations often discussed in the literature. Hence, greater clarity of these dynamics from an intra-organisational perspective is required.

Although both DT and digital platform streams of literature have been attracting growing interest from the research communities, as demonstrated by sections 2.2 and 2.3 of this literature review, not many contributions have attempted to integrate insights from these two streams. However, consideration and synthesis of more than one research stream has the potential to generate deeper insights (Leidner 2020). Therefore informed by the broader

literature on DT and the unique properties of digital platforms as an emerging IS phenomenon, I now turn my attention to how organisations can achieve DT through platformisation.

2.4 DT through Platformisation

An emerging stream of literature has illuminated the opportunity to bridge digital platform and DT streams of literature to offer insights into how platformisation can serve as a means of achieving DT. This comes from an increased recognition that traditional organisations in conventional industries can leverage digital platforms to improve efficiency (Bygstad and Hanseth 2018; Senyo et al. 2021) and adapt to digital disruption driven by platform organisations (Gregory et al. 2018; Cozzolino et al. 2021). Therefore, the focus of this thesis is on DT through platformisation as the main phenomenon.

2.4.1 Overview of existing literature

The sparse and inchoate branch of literature on DT through platformisation points to diverging perspectives. Practice-related literature has induced a discussion around viewing DT through platformisation, which is now being recognised in the academia. Cognate concepts such as "platform transformation" (Alt 2022), "platformisation" (Törmer and Henningsson 2020) and "digital platformisation (Senyo et al. 2021) have percolated in the wider DT literature. In this thesis, I adopt the term *DT through platformisation*. Although there are different perspectives on DT through platformisation, in this study I consider DT through platformisation a socio-technical process of transforming an organisation's systems to a platform architecture (Bygstad and Hanseth 2018; Törmer and Henningsson 2020). By adopting this view I abstain from literature focusing on established organisations' business model transformations to a platform-based model (Fürstenau and Anisimova 2019; Jääskeläinen et al. 2021; Alt 2022; Şimşek et al. 2022), or the transformation of existing ecosystems (Hermes et al. 2020; Tan et al. 2020). Many traditional, so-called pipeline organisations often do not aspire to become a platform organisation, or it might be an elusive goal, but they can still leverage the platform concept to improve their performance (Bygstad and Hanseth 2018).

For incumbent organisations, DT through platformisation has been imbued with persistent challenges, stemming from the complexity of their technology and organisational structures. Over the years organisations develop complex socio-technical intertwinements of "systems, users, routines and vendors" (Bygstad and Hanseth 2018 p. 4), which often serve the needs of organisational silos. From a technology stance, a complex web of applications and legacy systems can result in inefficiencies and redundancy of systems (Gregory et al. 2015; Bygstad and Hanseth 2018). This complexity is not always easy to dissolve due to history and path dependencies (Rolland et al. 2018; Rolland 2021). Rigid governance structures further exacerbate the issue and encumber organisations in achieving speed and flexibility to respond to market demands (Gregory et al. 2018). To that end, the extensive literature on platform ecosystems — such as the AppStore (Ghazawneh and Henfridsson 2013), provides an over-simplified view of a digital platform's evolution, which cannot be applied to most established organisations. Similarly, research on how SMEs use digital platforms to achieve DT does not capture the complexity inherent in larger types of organisations (Li et al. 2018; Mandviwalla and Flanagan 2021). Large, established organisations often build and use many different digital platforms and cloud micro-services (Vestues and Rolland 2021).

An organisational challenge lies in the hierarchical structures, characterised by bureaucracy and silos that can lead to a dissonance between units and a lack of a common vision (Schwer and Hitz 2018; Nadkarni and Prügl 2020). Silos are not easily dissolvable, as they rely on idiosyncrasies to function (Wimelius et al. 2020). These factors can lead to inertia — rigidity arising from the cementing of organising patterns and limits an organisation's ability to adapt

(Lyytinen and Newman 2008; Rolland et al. 2018). Tensions can arise between the existing technology and structures and new ways of operating (Wimelius et al. 2020; Verhoef et al. 2021). While DT can become necessary to break the inertia and improve an organisation's environmental fit (Besson and Rowe 2012), the barriers need to be identified and addressed to ensure DT through platformisation can progress (Rolland 2021).

Extant literature focusing on platformisation as a way to transform organisations has produced a fragmented and dissonant view, summarised in Table 7. A significant limitation of the extant literature in this area is the propensity to focus on the adoption of digital platforms, without unpacking the process of platformisation (Resca et al. 2013; Karimi and Walter 2015; Wimelius et al. 2020). By focusing on the initial adoption of a digital technology, the process of normalising and sustaining DT in an organisation remains ambiguous (Carroll and Mc Lafferty 2021). The attention given to a specific type of digital platform being implemented (Wimelius et al. 2020), leaves platformisation as a systematic, organisation-wide endeavour a neglected area of research.

The capabilities perspective adopted by some studies is equally limiting. There is more of a focus on the managerial, organisational and cultural aspects than the underlying technical aspects of the digital platforms (Karimi and Walter 2015; Li et al. 2018). Those studies paying more attention to the technical aspects tend to focus on IoT platforms (Ghosh et al. 2022). Moreover, they consider the use of established digital platforms as intermediaries for an organisation's products (e.g. Alibaba and Shopify) (Li et al. 2018; Mandviwalla and Flanagan 2021), and hence do not contribute to the discussion on how an organisation can transform its own operations through DT through platformisation internally.

The emphasis on the before and after state of DT through platformisation efforts in some studies, by highlighting a change in the affordances (Senyo et al. 2021), also leaves out the process of achieving the desired outcome unaddressed. This is similar to research underlining the barriers to the DT through platformisation process (Wimelius et al. 2020; Rolland 2021). Whilst useful in illuminating the challenges of such efforts, they do not capture how an organisation can successfully achieve DT through platformisation by achieving the desired outcome.

Anchoring this literature review towards the processes of DT through platformisation exhibits a greater dissonance. While these studies demonstrate how to build digital platform components, they present differing views. Some scholars discuss decoupling and recoupling of legacy systems to achieve DT through platformisation (Bygstad and Hanseth 2018; Vestues and Rolland 2021). Although digital platforms can foster modularity and decomposability, for many organisations with complex legacy systems, decoupling could be difficult to execute, due to tightly coupled components (Brunswicker et al. 2019). Other studies have found that to evade the limitations of their legacy systems, organisations may need to implement separate digital platforms to support more rapid innovation (Sebastian et al. 2017; Gregory et al. 2018). Hence, our understanding of how digital platforms emerge and evolve in organisations still remains very limited (de Reuver et al. 2017; Sigríður Islind 2018).

Table 7 — Themes in DT through Platformisation Literature

Theme	Source
Adoption of digital platforms	(Resca et al. 2013; Karimi and Walter 2015; Wimelius et al. 2020; Mandviwalla and Flanagan 2021)
Building capabilities	(Karimi and Walter 2015; Li et al. 2018; Mandviwalla and Flanagan 2021; Ghosh et al. 2022)
Focus on the before and after state	(Senyo et al. 2021)
Managing barriers to DT through platformisation (e.g. paradoxical tensions and inertia)	(Wimelius et al. 2020; Rolland 2021)
Building platform components	(Sebastian et al. 2017; Bygstad and Hanseth 2018; Gregory et al. 2018; Vestues and Rolland 2021)

A second limitation is an absence of conceptual clarity as to what constitutes a digital platform, resulting in a lack of cogency amongst studies. While many different technologies have been explored under the banner of digital platforms, there is a clear lack of focus on enterprise platforms, as demonstrated in Table 8. Moreover, the digital platforms identified as enterprise platforms, collectively focus on document, record and general administration management (Bygstad and Hanseth 2018; Wimelius et al. 2020; Rolland 2021), addressing a limited scope of enterprise platforms.

Yet, there has been an over-emphasis on IoT platforms (Baiyere et al. 2020; Sandberg et al. 2020; Jovanovic et al. 2022) and platforms in manufacturing industries — e.g. the automotive sector (Svahn 2017). These platforms are architecturally different from enterprise platforms, due to a "distinct combinations of hardware, software and networking elements" (Alt 2022 p.401). Sometimes called digital industry platforms, they exhibit greater complexity reflected in a more diverse set of digital devices and assets "ranging from laser cutting machines, to furnaces, to ships, to whole factories" (Pauli et al. 2021 p.183). The insights presented on DT through platformisation for digital industrial platforms, therefore serve a niche segment of organisations and cannot be applied in the context of institutions and other enterprises.

Yet, to evolve the academic enquiry in this area, we must delineate different types of digital platforms, and the purpose they serve (de Reuver et al. 2017). This is pivotal for our overall understanding of the role digital platforms play in DT, as organisations can pursue different pathways to achieve DT through platformisation (Cennamo et al. 2020; Jovanovic et al. 2022).

Table 8 — Types of digital platforms in DT literature

Type of platform	Reference
IoT	(Sandberg et al. 2020; Haaker et al. 2021; Ghosh et al. 2022; Jovanovic et al. 2022)
Social media	(Aral et al. 2013; Resca et al. 2013; Rahrovani 2020)
E-commerce	(Li et al. 2018; Mandviwalla and Flanagan 2021)
Mobile app	(v. Alberti-Alhtaybat et al. 2019)

Enterprise application platform (integration and web development)	(Bygstad and Hanseth 2018; Vestues and Rolland 2021)
Enterprise platform	(Bygstad and Hanseth 2018; Wimelius et al. 2020; Rolland 2021)

Dovetailing the argument on the prevalence of digital industrial platforms in DT through platformisation research, this area is heavily-focused on business-to-business (B2B) settings (Svahn 2017; Sandberg et al. 2020; Jovanovic et al. 2022). These types of platforms display fundamentally different dynamics to business-to-consumer (B2C) settings, as they typically deal with inter-relationships between firms (Pauli et al. 2021). For example, an industrial firm may partner with an entrepreneurial firm with digital expertise to achieve DT through platformisation (Hydle 2021).

Beyond the industrial manufacturing industry, other industries and sectors explored in this area include the health care industry (Bygstad and Hanseth 2018; Islind et al. 2019; Wimelius et al. 2020), customs management industry (Senyo et al. 2021), banking (Gregory et al. 2015; Gregory et al. 2018), insurance (Nicoletti 2021), retail (Li et al. 2018; Mandviwalla and Flanagan 2021), hospitality (Bygstad 2020), media (Karimi and Walter 2015) and the logistics industry (v. Alberti-Alhtaybat et al. 2019). The phenomenon appears to be emerging in both public (Senyo et al. 2021; Vestues and Rolland 2021) and private (Sia et al. 2021) sectors**.** For a summary of the explored industries and sectors in the literature, see Table 9.

Table 9 — Explored industry contexts in the literature

Industry Context	References
Industrial and Manufacturing	(Svahn 2017; Sandberg et al. 2020; Haaker et al. 2021; Hydle 2021; Rolland 2021; Jovanovic et al. 2022)
Government public sector	(Vestues 2019; Senyo et al. 2021; Vestues and Rolland 2021)
Financial services	(Sia 2016; Gregory et al. 2018; Nicoletti 2021)
Health care industry	(Bygstad and Hanseth 2018; Sigríður Islind 2018; Islind et al. 2019; Wimelius et al. 2020)
Retail	(Li et al. 2018; Mandviwalla and Flanagan 2021)
Hospitality	(Bygstad 2020)
Logistics	(v. Alberti-Alhtaybat et al. 2019)
Higher Education	(Piromalli and Viteritti 2019; Bygstad et al. 2022)

Despite the Higher Education sector going through a profound DT through platformisation (Tolmayer and Zsolt 2019), there is a paucity of research on institutions such as universities, beyond the teaching and learning aspects (Piromalli and Viteritti 2019; Bygstad et al. 2022). Yet, universities are complex institutions as well as enterprises (Henkel 1997), with ample opportunity to study DT through platformisation, as exemplified by practitioner literature (Yesner 2020). Academic studies in this sector have focused on business models of MOOCs (Chen and Geng 2022; Sharma et al. 2022) (e.g. Coursera, edX, Udacity), or the economic aspects of education technology (EdTech) (Komljenovic 2021; Komljenovic 2022), and not so much on how traditional universities can achieve an organisation-wide DT through platformisation.

There has also been an upsurge in interest on the topic of DT through platformisation in practitioner-related literature (Sebastian et al. 2017; Cennamo et al. 2020; Sia et al. 2021). These studies are geared towards providing advice for managers undergoing a DT. As such they lack theoretical grounding necessary to advance the understanding of this phenomenon.

Scholars have argued that the pervasive body of knowledge on DIs can inform the topic of DT through platformisation (Vestues and Rolland 2021). Strategies such as cultivation, adaptation and bootstrapping (Grisot et al. 2014; Koutsikouri et al. 2018) have been associated with the evolution of DIs. Nevertheless, there is a major limitation in this body of literature that prevents it from meaningfully informing the topic of DT through platformisation. The prevalent conceptualisation of DI as an "installed base" and its socio-technical arrangements focus on "what is already there". To that end, their evolution is more gradual and transpires over longer periods of time (Grisot et al. 2014 pg.200). It is for this reason that it is not well placed for providing insights for DT through platformisation. For DIs "transformations are unlikely and unwanted" (Øvrelid and Bygstad 2019 p.221).

The presented literature overview underscores the complexity of undergoing DT through platformisation in incumbent organisations. DT efforts can result in failures and additional, unnecessary complexity (Wimelius et al. 2020). The main limitations identified in the literature are as follows: 1) lack of understanding of the process of DT through platformisation, 2) overlooking enterprise platforms 3) shortage of research focusing on the higher education sector beyond teaching and learning, and 4) shortage of theoretically grounded studies.

Understanding how organisations can successfully achieve successful outcomes through DT through platformisation is less understood. Taking heed of how digital platforms emerge and evolve through the process of platformisation as a systematic, organisation-wide endeavour that leads to desired outcomes requires greater clarity. Next, I turn to the triggers of DT through platformisation.

2.4.2 Triggers of DT through Platformisation

The triggers leading to DT through platformisation in an organisational context have been observed as a confluence of endogenous and exogenous factors. Exogenous factors are the forces from outside the organisation that threaten its existence or exert pressure on the organisation to adapt. For example, the emergence of platform organisations have threatened companies in traditional industries and impelled them to update their business models, and offer new value propositions by leveraging digital platforms (Bygstad 2020). Platform organisations are also influencing consumer behaviour and expectations, forcing traditional organisations to transform their practices, such as governance structures to allow for greater flexibility in redesigning value propositions (Gregory et al. 2018).

Endogenous factors can mainly be attributed to inefficiency accumulated over the years in incumbent organisations, resulting in laborious and ineffective processes (Bygstad and Hanseth 2018; Senyo et al. 2021). This can often be a result of path-dependencies that lead to inertia (Rolland 2021). Incumbent organisations embark on DT through platformisation journeys to improve their overall operational efficiency and digitise their business processes (Bygstad and Hanseth 2018). The inability to innovate rapidly enough in a dynamic market can also motivate organisations to leverage digital platforms to circumvent the limitations of their legacy systems (Sebastian et al. 2017; Gregory et al. 2018).

2.4.3 DT through Platformisation Mechanisms

Research on the mechanisms of platformisation as a means of achieving DT is equally as scarce, as the research on mechanisms of DT in general. Although mechanisms of digital

infrastructure evolution have been explored for some time (Henfridsson and Bygstad 2013; Huang et al. 2017), they often focus on nascent industries and their scaling efforts (Henfridsson and Bygstad 2013; Huang et al. 2017). To that end, they are not applicable to established organisations with more complex technical landscapes. Moreover, digital infrastructures are characterised by greater openness and more organic evolutionary trajectories than digital platforms (Hanseth and Lyytinen 2010).

While prior work sheds some light on the architectural mechanisms of digital platforms, the focus of these studies is on innovation (Törmer 2018) and not DT. On the other hand, IoT platforms for example, covered by Sandberg et al. (2020) are architecturally different to enterprise platforms (Alt 2022). The same applies to large digital infrastructures in hospital settings, discussed by (Bygstad and Øvrelid 2020). At present time and to the best of my knowledge, no study has produced mechanisms of DT through platformisation in the context of enterprise platforms. Next, I take a look at how organisations can design and develop digital platforms to transform their organisations.

2.4.4 Architecting, Designing and Developing Digital Platforms for DT

Organisations can either build their own or join existing platforms (Warner and Wäger 2018). There has been more discussion recently pertaining to the latter, on how established organisations can join external digital platforms and ecosystems (Bashuri and Bailetti 2021; Simmonds et al. 2021; Furr et al. 2022; GTS 2022), and much less on how organisations can build their own digital platforms. Building and evolving digital platforms has been recognised as a key strategic imperative for organisations (Yoo et al. 2012). As information systems evolved from monolithic to two and three tier, multi-layer and modular architectures, organisations are increasingly engaging in transforming their infrastructures to digital platforms (Alt 2022).

Very few studies offer guidance on architecting digital platforms in larger organisations with established IT portfolios (Bygstad and Øvrelid 2020; Vestues and Rolland 2021). In these types of organisational contexts, digital platforms often coexist with other IS components and platforms as part of the organisation's overall technical landscape (Hanseth and Lyytinen 2010; Haki et al. 2020). For these types of organisations, transforming to digital platforms often involves discarding legacy systems (Alt 2022), which adds another layer of complexity. Whilst attempts have been made to study architectural configurations of platform ecosystems (e.g. mobile payment platforms) (Kazan et al. 2018; Blaschke et al. 2019), the reality of most incumbent organisation's technical landscapes is more complex (Bygstad and Hanseth 2018; Törmer and Henningsson 2020). In an established organisation, a digital platform can be integrated with other digital platforms and systems (Rolland et al. 2018; Vestues and Rolland 2021).

Architecture is an integral part of digital platform design (Spagnoletti et al. 2015). A digital platform's ability to evolve is contingent on its architectural design (Henfridsson and Bygstad 2013; Spagnoletti et al. 2015; Törmer 2018). Platform architecture can enable greater flexibility and adaptability to change (Henfridsson and Bygstad 2013; Richardson et al. 2014), but can, paradoxically also restrict its evolution by creating path-dependencies. The creation of a centralised architectural framework can guide organisations in steering away from path-dependencies towards the defined strategic architectural vision (Törmer 2018 b). Architectural choices can have long-lasting and often irreversible consequences (Tiwana et al. 2010; Agarwal and Tiwana 2015). The ongoing challenge is that the architecture must remain flexible enough to cater for changes unconceived at the digital platform's inception (Baldwin and

Woodard. 2009; Tiwana et al. 2010). A well-constructed architecture gives the digital platform the ability to continually adapt to keep organisations in sync with environmental demands (Agarwal and Tiwana 2015; Benbya et al. 2020).

Existing architectural frameworks are losing their relevance for DT through platformisation, as they are more static (Bygstad and Hanseth 2018). To date, the most common method of analysing the evolution of IS in organisations is enterprise architecture (EA). Organisations often use EA to form a holistic view of their technical landscapes and influence its design and evolution (Haki et al. 2020). However, the use of traditional tools such as enterprise architecture (EA) frameworks are not fitting for the dynamic and continually evolving nature of digital platforms, and as such they need to be revised (Masuda et al. 2021a). Digital platform evolution is not always strategic and driven by higher-order control such as architectural standards, but also emergent and bottom-up in nature. Whilst recent attempts have been made to understand IS evolution through the array of theories offered by complexity science, their contributions remain theoretical and are not grounded in empirical reality (Haki et al. 2020).

If we consider platformisation as the emergence and evolution of digital platforms (Rodon 2018), *design* can be considered a mechanisms of digital platform evolution (Asadullah et al. 2018b). Yet, this has not been empirically studied to a great extent. With most digital platform research focusing on established digital platforms, such as those of Apple (Ghazawneh and Henfridsson 2013) or SAP (Schreieck et al. 2021), our understanding of how digital platforms emerge and evolve through the process of platformisation remains minute (de Reuver et al. 2017; Sigríður Islind 2018). The question remains as to whether digital platforms emerge spontaneously, or if they can be intentionally designed (de Reuver et al. 2017; Vestues and Rolland 2021). Specifically, the knowledge on how an organisation can intentionally design a digital platform for a specific purpose remains piecemeal (Sigríður Islind 2018).

Scholars have continually criticised the lack of focus on the technical aspects of digital platforms in the context of DT (Vial 2019; Jovanovic et al. 2022) and beyond (Tiwana et al. 2010).The greater focus on organisational and managerial capabilities that lead to higher-level digital platform capabilities (Karimi and Walter 2015; Li et al. 2018) has left the technical aspects of digital platforms largely ignored in the theorisation process. Not surprisingly, our understanding of the actual design of digital platforms, as an IT artefact in DT, and their ability to help organisations adapt and evolve to their changing environments is insubstantial (Vial 2019). Hence, a greater focus on the technical and architectural aspects of digital platforms in the theorising process is required for a better understanding of how these technologies can contribute to DT (Tiwana et al. 2010; Jovanovic et al. 2022).

While off-the-shelf platforms are becoming increasingly widespread (Törmer 2018), organisations may opt for strategic differentiation in functional areas through the development of propriety platforms (Alt 2022). Although IS design and development literature has had a long-standing tradition, encompassing a gamut of different processes, methods and approaches (Ba et al. 2001; Alter and Browne 2005; Vidgen and Wang 2009; Zaitsev et al. 2020), their wisdom is being called into question given the fundamental differences between digital platforms and past-generation of systems with clearly defined boundaries and functions (Hanseth and Rodon Modol 2021). Digital platforms have fluid boundaries and a greater ability to evolve. The challenge then is that components can be designed without knowing how they will integrate with others, within the whole (Yoo et al. 2012; Yoo 2013). Consequently, traditional IS design and development approaches are not fit for design and development of digital platforms as part of the DT process, as they are built on the assumption that system design is a project (Baghizadeh et al. 2019). However, DT through platformisation is not a

project, but an ongoing process, a journey, or a way of operating (Vial 2019) and requires fundamentally different approaches.

To wit, designing digital platforms requires a paradigm shift to a more flexible approach, capable of supporting an ever-expanding set of re-configurable components (Resca et al. 2013). This dynamic and evolving nature of digital platforms calls for design tenets that can address a generic suit of functions to cultivate growing heterogeneity (Hanseth and Lyytinen 2010; Spagnoletti et al. 2015). This can be achieved by shifting the focus from traditional approaches to dynamic repositories of generic components that can be recombined to bring about new solutions with ease (Ross et al. 2019). As the number of components grows, a catalogue of different options emerges for different stakeholders to leverage in creating new solutions. As the underlying technology is abstracted, the components can be used even by business users, with less technical knowledge (Gregory et al. 2018).

The complexity of intertwining technical, organisational and social factors requires a holistic, multi-faceted approach to design (Tilson et al. 2010), grounded in the socio-technical view of digital platforms. This means that designing and developing platforms is not just driven by organisational requirements. Technology is deeply weaved into the organisation's fabric. As a result, new requirements also emerge as a result of technology (Haki et al. 2020). Complexity science has attempted to bridge the limitation of the more traditional approaches by accounting for the multilevel nature of design and development and the interdependencies between different levels (Benbya and McKelvey 2006a; Kautz 2012).

2.4.5 Organisational Outcomes of DT through platformisation

The underlying assumption of most DT research is that digital technology will improve organisational outcomes (Wessel et al. 2021). However, it is also clear that many DT efforts end up falling short of what they set out to achieve (Correani et al. 2020; Wimelius et al. 2020). Outcomes of DT can be considered as snapshots, or the observable changes in the organisation over the course of DT (Hanelt et al. 2020; Urbinati et al. 2021). Our understanding of the outcomes of DT remains limited, with most extant research focusing on the implications of digital technologies on innovation, rather than organisational change. Yet, turning our attention to organisational change is necessary to understand DT as an all-encompassing phenomenon with transformative effects (Vial 2019). It is important to note that outcomes of DT should not be viewed as deterministic, or equating to some desirable permanent end-state (Sandberg et al. 2020). In a highly dynamic and often turbulent world change is constant and ongoing (Pavlou and El Sawy 2010). Consequently, the outcomes are continually evolving.

Although business model transformation is commonly discussed as an outcome of DT through platformisation, extant studies are typically externally-focused, emphasising how organisations can integrate external party complements into an ecosystem by building their own (Jääskeläinen et al. 2021; Tavoletti et al. 2021; Şimşek et al. 2022), or joining an existing ecosystem (Godin and Terekhova 2022). However, most established organisations do not aspire to become a platform organisation (Bygstad and Hanseth 2018). What remains unclear is how these established organisations can introduce new value propositions and update their business models, without becoming a platform-based model. See for example (Bygstad 2020) for an illustration of a business model change in the hotel industry.

To continually adapt to an increasingly digital world, organisations must at times implement multiple business models within a single firm, alongside their traditional offerings (Li 2020). As such they must possess the ability to effectively manage their traditional business model, in addition to the emerging business models (Enkel et al. 2020). Digital platforms can also

facilitate business model transformation by enabling omni-channel experiences for its consumers (El Sawy et al. 2016; Gregory et al. 2018; Yeow et al. 2018). Digital platforms have enabled many organisations such as educational institutions to switch to new modes of operation during COVID-19. The change involved more than supporting existing digital models by upholding virtual classes, but redesigning their educational products as well (Seetharaman 2020). Disruptive new business models enabled by digital platforms have also been observed in the logistics (v. Alberti-Alhtaybat et al. 2019) and manufacturing industries (Haaker et al. 2021; Ghosh et al. 2022; Şimşek et al. 2022).

Although DT is often associated with strategic change (Chanias et al. 2019), it can also have implications for operational efficiency (Vial 2019; Senyo et al. 2021). Operational improvements in high stake industries like healthcare (Islind et al. 2019; Bygstad and Øvrelid 2020) are examples of this trend, especially during the COVID-19 pandemic (Schaffer 2021). Industries characterised by fast-paced dynamics (e.g. the logistics industry) are also benefiting from the operational improvements afforded by digital platforms to improve the overall customer experience (v. Alberti-Alhtaybat et al. 2019).

Operational improvements have been observed as a result of dissolving IT silos, increasing collaboration and improving business processes. The process of DT through platformisation transforms IT silos into platform architectures facilitating integration and standardisation (Bygstad and Hanseth 2018; Senyo et al. 2021; Vestues and Rolland 2021). In addition to technology changes, digital platforms can lead to new, more malleable organisational structures (Resca et al. 2013). For example, changing from centralised to decentralised functional domains responsible for their own digital platforms (Sia et al. 2021; Vestues and Rolland 2021), or conversely a more centralised and integrated function in control of the common digital platform efforts (Bygstad and Hanseth 2018).

Further to the argument, we are also witnessing the merging of IT and business functions (Bharadwaj et al. 2013a; Sia et al. 2021), as well as the emergence of new, semi-autonomous teams and departments responsible for carrying out the platformisation agenda (Svahn 2017; Bygstad and Hanseth 2018). Often traditional IT departments do not possess the necessary skills for new innovative efforts forcing organisations to hire new talent or support the formation of start-ups with the right expertise (Bygstad 2020; Hydle 2021). The need for new talent is reflected in the emergence of new, specialised digital roles (Tumbas et al. 2018).

Greater operational efficiency is reflected in possible process improvements that can eliminate duplication of work, by consolidating processes and enabling greater process transparency. It can also lead to the introduction of new processes (Senyo et al. 2021). For example, through automation (Guenzi and Habel 2020) or the re-engineering of processes (Bygstad and Øvrelid 2020). There have been numerous examples of innovative processes emerging as a result of digital platforms in a number of industries, including the logistics industry (v. Alberti-Alhtaybat et al. 2019) and customer service optimisation in the telecom industry (Correani et al. 2020).

DT through platformisation has also been associated with enabling capabilities such as agility and ambidexterity (Sebastian et al. 2017; Sia et al. 2021), allowing organisations to continually adapt to their environment. Digital platforms can support organisations in continually monitoring and adapting to their environment with greater velocity and dexterity (Richardson et al. 2014; Kovacevic-Opacic and Marjanovic 2021; Verhoef et al. 2021). Ambidexterity on the other hand is the duality of engaging in simultaneous pursuit of strategic opportunities and operational gains (Vial 2019). Digital platforms can allow organisations to explore new opportunities and value propositions (e.g. through ease of innovation), while at the same time exploiting existing resources, by optimising operational performance (e.g. by providing an operational backbone supporting core operations). (Sebastian et al. 2017). To that end,

ambidexterity, enabled by digital platforms can help organisations manage existing capabilities with the emerging digital capabilities in a harmonious way (Nadkarni and Prügl 2020). While ambidexterity as an outcome of utilising digital platforms as part of DT has been explored in practitioner literature, greater theoretical grounding is required for a more comprehensive understanding. Organisational outcomes of DT through platformisation observed in the literature are summarised in Table 10 below.

Table 10 — Organisational Outcomes of DT through platformisation

Organisational Outcome	Reference
Business model transformation	(Karimi and Walter 2015; v. Alberti-Alhtaybat et al. 2019; Bygstad 2020)
Operational efficiency	(Dery 2017; Bygstad and Hanseth 2018; Bygstad and Øvrelid 2020; Senyo et al. 2021; Vestues and Rolland 2021)
Agility	(Kovacevic-Opacic and Marjanovic 2021; Kovacevic-Opacic and Marjanovic 2022; Salmela and Galliers 2022)
Ambidexterity	(Sebastian et al. 2017; Sia et al. 2021)

2.4.6 Summary

The conducted literature review provides evidence of platformisation as a salient angle for studying DT. There has been extensive interest in both digital platforms and DT, yet very few studies have considered uniting these two emerging streams of literature for generating new insights. Our understanding of the overall process of DT through platformisation remains limited, due to a heavier focus on other aspects, such as the adoption of digital platforms. This literature review establishes that the organisational perspective, and internal digital platforms in particular have not received as much scholarly attention to date. This highlights the importance of pursuing mechanisms of DT through platformisation, particularly from the intra-organisational perspective, as an avenue of future research.

Furthermore, greater research is required on enterprise platforms, as they are architecturally different from IoT platforms often emphasised in the literature. With digital platforms spurring change in multiple traditional industries, it is unfortunate that the Higher Education sector remains an under-explored area of research. Yet, there is growing evidence of the significance of digital platforms and DT in this context, from practice-related literature (Yesner 2020). Architecting, designing and developing digital platforms as part of DT through platformisation presents as a germane aspect to explore and one that is under-developed in the literature.

DT through platformisation, like other types of DT is prone to challenges, or veering off the intended course, due to the inherent complexity present in incumbent organisations. Greater understanding of the organisational outcomes, associated with DT through platformisation is required to inform the ongoing discourse on this topic. Next, I turn to the theoretical foundations underpinning this research.

Chapter 3: Theoretical Foundations

In this chapter, I present the theoretical foundations I draw on in this thesis. The coevolution theory has been adopted to guide data collection and analysis in line with my interpretivist approach. I begin with the justification for using this theory in this thesis, followed by a discussion of its origins and its characteristics.

3.1 Suitability of the Coevolution Theory for This Research

Table 11 summarises the theoretical lenses used in the studies of DT through platformisation to date. Collectively, these studies have employed a diversity of theoretical lenses. What is lacking is a more holistic view of how an organisation can achieve DT through platformisation by considering multiple levels in the organisation. The adoption of single-lens theories (e.g. technology affordance theory and path theory) cannot adequately capture the complexity of DT through platformisation.

Traditionally, punctuated equilibrium (PE) has been the prevalent theory used for observing organisational transformations (Tushman and Anderson 1986; Gersick 1991). While punctuated equilibrium (PE) models have been used to explain organisational change in the past, several limitations have been identified with this approach for DT. This theory posits that periods of equilibrium are punctuated by sporadic episodes of revolutionary change (Gersick 1991; Lyytinen and Newman 2008). A distinction is drawn between episodic change that is considered more radical and continuous change as evolutionary and incremental (Weick and Quinn 1999).

The problem with upholding this dichotomy is that, while it may have held true in the past, the advent of digital technologies and their ongoing development have fundamentally changed how organisations implement new technologies and the speed at which they do so. Although scholars contend that periodic punctuations may be necessary when organisational design is not fit for its environment, ultimately punctuated change can still lead to continuous change (Hanelt et al. 2020). This is attributed to the dynamic and generative nature of digital technologies (Yoo et al. 2012). This presents as a significant shortcoming of the punctuated equilibrium theory for studying DT and dynamic and ongoing change.

Another major limitation of the PE theoretical lens in analysing DT is the assumption that systems or organisations shift to equilibrium after a period of radical change. Today's organisations and their respective IS are in a constant state of flux marked by non-linearity and equifinality, rendering them as complex adaptive systems. As such they may never reach a state of equilibrium (Hanelt et al. 2020). This keeps organisations in a perpetual state of dynamic equilibrium (Smith and Lewis 2011).

If equilibrium is established, it may be fitting to treat the environment as an external factor. However, if there is no equilibrium the evolution may continue over a period of time (Baum and Singh 1994). As organisations and systems continually shift from equilibrium to adapt to an ever-changing environment, this gives rise to emergent control and order, as opposed to hierarchical control (Dooley 1997). PE, however, does not account for the processes that lead to transitions to new organisational or system forms (Lewin and Volberda 1999).

An alternative view of DT has been explored through paradoxical tensions (Gregory et al. 2015; Rolland et al. 2018; Wimelius et al. 2020). Indeed, digital technologies are characterised by a number of paradoxes, such as the paradox of change and control, which have been explored extensively (Tilson et al. 2012; Ghazawneh and Henfridsson 2013). Theories of paradox are useful in highlighting the opposing dualities and challenges that arise during DT

journeys over a longer period of time and how to manage them (Gregory et al. 2015; Wimelius et al. 2020). However, they also demonstrate that these tension steer the DT efforts away from the intended trajectory and lead to the adoption of digital platforms in a "radically different way than originally envisioned" (Wimelius et al. 2020 p.215). Because paradoxical tensions cannot be resolved they need to be managed (Smith and Lewis 2011). Hence, the focus of such studies in on managing coexisting tensions, as opposed to the evolutionary process. While this lens has been usefully applied in studying platform management (Rolland et al. 2018) and the paradoxes associated with DT programs (Gregory et al. 2015; Wimelius et al. 2020), it is not suitable for explaining the process of DT through platformisation.

Single-lens theoretical perspectives — e.g. technology affordance theory (Senyo et al. 2021), on the other hand, cannot adequately capture the complexity of the phenomenon under investigation, which is characterised by dynamic change, accounting for intentionality as well as emergence. The limitation of these theories is that they offer only partial explanations of complex phenomena and cannot explain how and why coevolution within and between organisations transpires over time (Volberda and Lewin 2003).

Complexity theories have not been used to a great extent in studies of DT through platformisation, with notable exceptions employing complex adaptive systems (Sandberg et al. 2020) and coevolution (Jovanovic et al. 2022) theories. While complexity theory can capture complex dynamics leading to phase transitions along the DT journey (Sandberg et al. 2020), it does not capture the intricate reciprocal interactions of coevolving entities, in the way that coevolution theory does. However, to date, studies of DT and digital platforms have mainly used coevolution, as an overarching paradigm (Tiwana et al. 2010; Taj et al. 2021; Zorina and Karanasios 2021; Jovanovic et al. 2022), rather than delving into the rich array of concepts the coevolution theory has to offer. Studies focusing on the properties and adaption principles of coevolution are rare — see for example (Montealegre et al. 2014). The problem with former approaches is that they are largely metaphorical. Although metaphors hold value in theorisation, "lack of specificity, formal identity, and precise definition can yield truisms that mislead and fail the test of science" (Kozlowski 2000 p.5).

Table 11 — Different theoretical lenses adopted for study of DT through platformisation

Theoretical lens	Source
Technology affordance theory	(Senyo et al. 2021)
Paradoxical tensions	(Gregory et al. 2015; Wimelius et al. 2020)
Punctuated Equilibrium	Gregory 2018
Complex Adaptive Systems Theory	(Sandberg et al. 2020)
Coevolution as a high-level concept not utilising constructs from coevolution theory but platform literature	(Jovanovic et al. 2022)
Path theory (PT) and assemblage theory (AT)	

The rise of digital technologies and their underlying complexity has highlighted the pertinence of complexity theories (including coevolution as a branch of complexity science) for digital phenomena (Benbya et al. 2020). Coevolution theory is suitable for the study of digital platforms (Tiwana et al. 2010), as complex, open socio-technical systems with fluid boundaries, which cannot be predefined (Hanseth and Rodon Modol 2021). It accounts for the emergent nature of IS as opposed to the traditional top-down methods (Benbya and McKelvey 2006a).

Coevolution theory is appropriate for studying organisational transformations and their underlying IS by taking a multi-agent, multilevel view of change (Allen and Varga 2006). Recognising DT through platformisation is an ongoing process, as opposed to an attainable state, makes the coevolutionary lens a particularly pertinent one. This conforms to the premise that DT through platformisation transpires through multilevel and multi-directional change.

Contrary to evolutionary theories, it does not view entities in isolation, but as part of a broader context, focusing on the mutually-shaping interactions between entities and their environment (Peppard and Breu 2003; Allen and Varga 2006). Coevolution is focused on order creation, while evolutionary theories are more focused on maintaining equilibrium (McKelvey 2004a; Zhang et al. 2020). Coevolution emphasises the importance of contextual factors and the continual co-adaptation between entities (Kim and Kaplan 2006). I acknowledge that DT through platformisation occurs within the organisational context, and a wider environmental context. As such, it is a part of a complex system and not an isolated process. This makes it a fitting lens to observe the interplay between the strategic and the digital platform levels in the organisation and how they reciprocally influence and change one another. Since coevolution results in permanent, mutual alterations in entities, and the organisation as a whole, a mechanism is required to bring about this change in organisations. (Porter 2016). Drawing from the range of concepts offered by coevolution theory including its properties and adaptation principles is suitable for deriving mechanisms of DT through platformisation.

Coevolution theory also allows for a more holistic explanation of the phenomenon, by observing changes between the different levels over a certain time and their environment. In that vein, the micro-level mechanisms are observed in the context of the wider macro environment. Coevolution theory allows for a merging of a strong focus on intra-organisational processes of change as interactions with their broader environment, whether internal or external (Hanelt et al. 2020). Considering the macro to micro relationship adds more richness to the theoretical constructs (Kozlowski 2000). The micro to macro relationship is outside the scope of the study.

This study satisfies the proposed criteria for coevolution research, summarised in Table 12 below, which as noted by Lewin and Volberda (1999) does not need to all be satisfied in a single study.

Table 12 — Selection criteria for coevolutionary studies

Selection Criteria	Evidence of addressing the criteria
Longitudinal studies	The research was conducted over 18 months
Consider historical context of firm and its environment	Factors leading up to DT through platformisation were examined

Examine the multidirectional causalities between the internal and the external environment	External (e.g. changes in the market and the COVID-19 crisis) as well as internal (e.g. need to optimise operations) environmental factors were considered.
Consider mutual, simultaneous, lagged, and nested effects	The mutual interactions between the strategic and the digital platform levels, within the organisational and the wider environmental context were considered
Address path dependencies	Path-dependences expressed as institutional norms, policies expectations were addressed
Apply a multilevel analysis	Two levels (strategic and digital platform levels), in addition to macro level and other micro level influences were analysed.
Consider macro-level variables (economic, social and political)	While the macro level factors were considered in relation to the micro organisational factors, the wider macro-level variables are outside the scope of this study. Moreover, interpretivist research is not concerned with the identification of variables.

Adopted from Lewin and Volberda (1999)

In sum, coevolution was deemed a suitable choice of theoretical lens for this study, due to its ability to capture both the micro-level processes and the macro to micro relationship. The micro-level processes, as the reciprocal interactions of multiple organisational levels, allowed me to derive the DT mechanisms of platformisation, by analysing the interactions between the strategic level and the digital platform level. It also allowed me to form a more holistic view of the DT through platformisation phenomenon by observing the macro to micro level change — that is how external triggers affect the overall coevolution process.

3.2 Origins of Coevolution Theory

The application of complexity science has a long-standing tradition for study of nonlinear dynamics in natural and social sciences (Benbya et al. 2020). The late 20th century saw the rise of complexity theory and complex adaptive systems, favouring self-organisation principles, over Newtonian, deterministic epistemologies (Kauffman 1993; Porter 2016). In the absence of a universal theory (Merali 2006), complexity science has been recognised as a paradigm encompassing concepts such as coevolution, emergence, chaos and scalable dynamics (Benbya et al. 2020). These concepts have sprung up as pertinent lenses for studying complex systems behaviour (Merali 2006). An important distinction delineated by complexity theorists is the complicated vs complex phenomena. Complicated systems can be understood as a sum of parts. Complex systems, in contrast are comprised of populations of interrelated entities. As such the system behaviour emerges as a result of these interactions and cannot be predicted (Kim and Kaplan 2006).

Most relationships in the world are in fact non-linear (e.g. weather forecasting) and cannot be predetermined (Vessey and Ward 2013). The future is made up of interaction (Allen and Varga 2006). To that end, complexity cannot be represented by reductionist approaches in traditional

science – explaining the behaviour of components as the system behaviour as a whole, or by analysing how precursory variables affect the outcome. Rather, causality should be viewed as a coevolution of the four Aristotle's causes (material, final, formal, and efficient) as well as the micro and macro relationship in the environment (McKelvey 2004a).

The emergence of the term *coevolution* is rooted in the field of biology when it was coined to explain the mutualistic relationship between butterflies and plants (Ehrlich and Raven 1964). In biology, coevolution theory explains the reciprocal exchanges between species and their environment and how they evolve in relation to one another (Ehrlich and Raven 1967). The term applies to two or more species coevolving as a result of their reciprocal interactions (Futuyma 2010). Kauffman (1993) notes that all evolution is in fact coevolution: "The true and stunning success of biology reflects the fact that organisms do not merely evolve, they coevolve both with other organisms and with a changing abiotic environment" (p. 287). Distinct from evolutionary theories which view entities in isolation, coevolution recognises the joint evolution of species (Peppard and Breu 2003). Coevolution has been observed as either *direct* — where two populations evolve in relation to each other, or *diffuse* — where one or more populations evolve as a result of changes in various other populations in the ecosystem (Baum and Singh 1994). As entities adapt to their environment, the environment, in turn, adapts to them (Vessey and Ward 2013; Benbya et al. 2020). Biological coevolution is based on the premise of specificity, reciprocity and simultaneity, although general consensus is lacking as to whether all conditions must be met (Porter 2016).

McKelvey (2002) distinguishes between two coevolution schools of thought: the European view and the American view, diverging due to different interpretations of the role of 2nd Law of Thermodynamics. The proponents of the European view (Haken 1983; Prigogine 1997) focus on phase transitions occurring at first and second critical values of R (Reynolds number). A critical Reynolds number in fluid dynamics is the threshold where laminar flow transitions into turbulent flow (Rehm and Haghshenas 2012). The transitions at first and second critical values of R are called the region of emergent complexity and are adaptive tensions (McKelvey 2002; Merali and McKelvey 2006), which is the measure of energy imposing on the system. The first and second critical values in tandem delineate three different states of complexity; stability, emergence, also known as the edge of chaos and chaos (McKelvey 2002). The European school of though is in line with the punctuated equilibrium model of change (Arikan 2007).

Whilst the European school of thought concentrates on the first value of R, the realm of emergence, the American school of thought focuses on the second value of R, or the edge of chaos. While the realm of emergence is better understood, the edge of chaos is somewhat more ambiguous (McKelvey 2002). This school focuses on instigating events that generate positive-feedback loops, coevolution and power laws. (Benbya and McKelvey 2006a). These small instigating events dubbed the "butterfly effect" can lead to flow-on complexity of much larger proportion. Hence, coevolution has been described as the "engine" of complex system adaptation (McKelvey 2002).

3.3 Coevolution Theory in the Organisational Context

Complexity theories, including the theory of coevolution, have been used for studies of *nonlinear dynamics*, *emergence* and *coevolution* in a number of disciplines, including IS (Benbya et al. 2020). The organisational perspective on coevolution sits at the cusp of complexity theory, open systems theory, evolutionary organisation theories and the eco-social-historical context. The concept of coevolution made its way into organisational science in 1980s (Porter 2016). Its aim was to explain how organisations evolve in relation to each other and their environments (Baum and Singh 1994; Lewin and Volberda 1999; Benbya et

al. 2020). Change can be propelled from both direct interactions between entities and feedback from the rest of the system or organisation (Baum and Singh 1994; Lewin and Volberda 1999). However, coevolution in the organisational context is distinct from biological coevolution, because human reasoning generates meaning (Porter 2016). Moreover, human learning is more rapid than biological change, hence the emergence of new organisational forms is also more frequent and varied (Lewin et al. 1999; Porter 2016). Therefore, coevolution drives this adaptive process. Coevolution, as a mechanism for order creation can facilitate innovation, adaptation and ultimately subsistence in a fast-changing world (McKelvey 2002).

The early conceptualisation of organisations drawing from systems theory was that they are independent from their environments and impose structures in a rational, deliberate way (Porter 2016**).** This view has shifted to one that conceptualises organisations as complex adaptive systems (Lewin et al. 1999; Vessey and Ward 2013)**.** Factors influencing the complexity of a system are diversity, adaptability, connectedness and mutual dependency among agents (Benbya et al. 2020). This concept extends systems from closed to open systems, beyond the boundaries of a single organisation (Volberda and Lewin 2003). These systems are open because they exchange resources with the environment and they are systems because they are comprised of interrelated components that form the whole (Anderson 1999; Allen and Varga 2006). This representation is fitting for today's organisations competing in increasingly dynamic environments, characterised by nonlinearity (Merali 2006; Vessey and Ward 2013).

Coevolution theory has the potential to overcome the limitations of single-lens and evolutionary theories (Lewin and Volberda 1999).There is a disconnect in the debate between organisational ecology theories seeking to explicate evolution at the organisation level as a result of processes of selection, variation, and retention, and strategic management theories focusing on intra-organisational adaptation, as a result of strategic endeavours. These theories alone provide a unilateral view – strategic management theories do not consider the macro-level organisational adaptation and ecology theories do not consider the intra-organisational level adaptation (Volberda and Lewin 2003). The coevolutionary perspective has the potential to bridge the discourse between these two areas by considering both organic evolution and managerial intentionality (Lewin et al. 1999; Volberda and Lewin 2003). Porter (2016) notes that coevolution is "more than a mere remake of evolution in a new suit of clothes, coevolution brings a powerful new logic and distinctive analytical tools to the longitudinal, multileveled study of organisations" (p. 488). Moreover, external environmental factors driving macro level change are relatively rare, as opposed to coevolutionary organisational change. "Organisational evolutionists and ecologists may have spent the last two decades studying the tip of the iceberg, leaving the more telling story of firm coevolution underdeveloped" (McKelvey 1997 p. 359). Levin and Volberda (1999) note "coevolution frameworks will inform any research in organisation studies, which spans levels of analyses and involves adaptation over time" (p. 520). However, scholars contend that studying coevolution is a complex endeavour, as the properties are often imperceptible and the change non-linear (Baum and Singh 1994).

Adaptation-selection theories can be observed from three perspectives: the micro level, the meso level and the level that links the micro to macro level (Volberda and Lewin 2003). Micro or intra-organisational theories associate internal capabilities and strategy to adaptation and survival. They are often concerned with identifying mechanisms of adaptation. Coevolution at this micro level must possess "identifiable motive, mechanism, and means of replication" (Porter 2016 p.494). Meso level, on the other hand, or the inter-organisational theories are boundary-crossing and connect the organisation with the competitive macro environment. Finally, the last level of analysis focuses on the wider macro environment consisting of social,

political and technological factors and the institutional, industry and organisational levels (Volberda and Lewin 2003).

As organisations achieve micro-level adaptability, in turn macro-level effects can be generated. Even a single agent in an organisation, through their interactions can affect the society at large (Allen and Varga 2006; Maitlis and Sonenshein 2010). Historically, the macro (external context) and the micro (firm adaptations) have largely been studied in isolation (Gaye 2008). Yet, there is merit in combining these perspectives to generate powerful new insights (McKelvey 1997; Lewin and Volberda 1999).

Coevolution theory has been used in strategic management and organisational ecology for decades (Koza and Lewin 1998; Simmonds et al. 2021), as well as in the IS field, although to a lesser extent. Yet, the multidisciplinary nature of information systems (IS), makes coevolutionary concepts potentially insightful to this field (Gaye 2008). Coevolution theory in IS has been used to explain business and IS alignment (Peppard and Breu 2003; Benbya and McKelvey 2006b; Vessey and Ward 2013), IS development (Benbya and McKelvey 2006a; Vidgen and Wang 2009), development of IS services (Montealegre et al. 2014), IS implementation (Kim and Kaplan 2006), IT innovation and communities (Zorina and Karanasios 2021), coevolution of platform architecture, governance and environmental factors (Tiwana et al. 2010), and a coevolution of platform architecture, governance and services (Jovanovic et al. 2022) to name a few.

Complex systems are defined by three fluctuating states; stability, chaos and edge of chaos. The lower end of the scale is marked by stability, where the characteristics of complexity are low. The system is therefore relying on predictive patterns, and novelty is rare (Benbya et al. 2020). Stability is characterised by self-reinforcement, during which rational knowledge exists (Allen and Varga 2006).

The edge of chaos is a paradoxical state between stability and instability (Benbya and McKelvey 2006a; Benbya et al. 2020). It is the zone of emergence that gives rise to coevolution (Boisot and McKelvey 2010; Porter 2016). In this state, systems never achieve equilibrium, but never cease to operate either. This state is characterised by continuous change and adaptation, (Kauffman 1993; Lewin et al. 1999). Organisations as complex adaptive systems are always operating at the edge of chaos, where they strive to foster stability, while at the same time increasing their ability to adapt to change (Lewin and Volberda 1999).

As the level of tensions increases above a threshold, it leads to chaos, which is defined by extreme and unpredictable contexts, such as catastrophes or crises (Benbya et al. 2020). This state is characterised by instability and the absence of self-reinforcement. During periods of instability, marked by unknowns, rational decision-making is not possible (Allen and Varga 2006).

A number of conditions must be met to set coevolution into motion. These are heterogeneity, adaptability, reciprocity, a high-level constraint and an instigating event (McKelvey 2002). The first condition relates to agent heterogeneity. In social systems, an agent can be an individual, group, department or organisation (Anderson 1999). In computer systems, agents can be hardware and software components (Merali 2006). The heterogeneity of agents provides adaptive capabilities for the system as a whole, through structures and organising. Adaptive capacity of agents is to have receptivity and awareness of changes in others and their environment. There must also be a level of responsiveness to act, because if it is below a certain threshold, the reaction will remain dormant. Reciprocity relies on the ability of agents to mutually influence each other (McKelvey 2002).

Contextual constraints can often be a trigger for coevolutionary dynamics. For example, if there is a change in shared resources, this could instigate coevolutionary change. Coevolution can also be triggered by events, either internal or external (McKelvey 2002).

External events often become the instigating factors propelling organisations to coevolve. Turbulence, interaction, feedback and multilevel effects set the conditions under which coevolution speeds up (Porter 2016). For this reason, it is not just variety that becomes crucial in a highly dynamic environment, but also the rate of adaptation. Known as the Red queen paradox, this rapid coevolution reflects the dynamics in today's hypercompetitive environments (McKelvey 2002). In Lewis Carroll's, Through the Looking-Glass (Carroll 1917), the Red Queen tells Alice she must keep running to remain in the same spot. The same analogy can be applied to organisations, forced to be rapidly adapting to keep up with their competition, in a constant race for survival (Agarwal and Tiwana 2015). Innovative capabilities in a firm may confer it a competitive advantage, but it is quickly eroded by increased competition in the environment (Lewin and Volberda 1999). To that end, to win in the Red Queen race organisations in high-velocity, turbulent environments must possess an aptitude to launch frequent experiments (McKelvey 2002).

To reiterate, coevolution is both deliberate and emergent – a consequence of combined managerial intent, the macro environment and micro-organisational effects. Organisations build capabilities either through managerial intentionality or through the emergent evolutionary changes in organisational practices. Strategy can be emergent, rather than deliberate, as a result of environmental changes and the process of coevolution (Barnett and Park 1994). However, established organisations, in particular, are characterised by formal structures and hierarchical control, and often rely on managerial interposition (Vessey and Ward 2013). Next, I take a look at the properties of coevolution.

3.4 Properties of Coevolution

The coevolution theory offers a rich array of concepts for describing the effects of coevolutionary dynamics. These can be referred to as properties of coevolution (Lewin and Volberda 1999; Montealegre et al. 2014; Porter 2016) and are captured in Table 13 below.

Table 13 — Properties of Coevolution

Property	Description	References
Multilevel effects	Coevolution manifests within and between organisations and their environment at multiple levels.	(Baum and Singh 1994; McKelvey 1997; Lewin and Volberda 1999; Benbya and McKelvey 2006b)
Multi-directional effects	Domains do not evolve in isolation, but coevolve with each other and their environment. Coevolution can be driven from top-down, bottom-up, diagonally, horizontally or vertically.	(Baum and Singh 1994; Lewin and Volberda 1999; Benbya and McKelvey 2006b)
Nonlinearity	Coevolution cannot be attributed to simple cause-effect relationships. Small	(Lewin and Volberda 1999; Vessey and Ward 2013)

	changes in input can lead to unproportioned changes in output and the reverse.	
Emergence	The generation of unanticipated outcomes, complexity and novelty.	(Vidgen and Wang 2009; Vessey and Ward 2013; Benbya et al. 2020)
Path and history dependencies	Adaptation in coevolution is contingent on history and path-dependencies of irrevocable changes and past actions.	(Koza and Lewin 1998; Lewin and Volberda 1999; Vessey and Ward 2013)
Genetic Fixation	Structural or other permanent change resulting from coevolutionary dynamics.	(Porter 2016; Parisot 2019)

3.4.1 Multilevel Effects

Coevolution results in multilevel effects, manifesting within and between organisations and their environment. Change can occur on the intra-organisational, inter-organisational, population and community levels (Baum and Singh 1994). Macroevolution theory is concerned with competitive dynamics between organisations within their environment. For example, organisational research in this area has focused on the coevolution of strategic alliances (Koza and Lewin 1998) and how organisation collaborate or compete for resources and customers (Allen and Varga 2006). The micro-coevolution theory adopts an intra-organisational view, focusing on resources, capabilities and competencies within the organisation (McKelvey 1997; Lewin and Volberda 1999). The microevolution perspective recognises that coevolution occurs on multiple levels within the organisation (McKelvey 1997). These levels can represent individuals, teams or departments (Allen and Varga 2006). Microcoevolution is embedded in and occurs in the context of macrocoevolutionary, selectionist, competitive tensions. (Baum and Singh 1994; McKelvey 1997). Hence, an organisation's ability to coevolve with the macro-level competition hinges on its internal, microcoevolutionary processes (McKelvey 2002). However, the nature of the macro-micro relationship is largely intertwined.

3.4.2 Multi-directional effects

Coevolution is characterised by multi-directional relationships (i.e. top-down, bottom-up, diagonal, horizontal or vertical) (Benbya and McKelvey 2006a). Changes in coevolving entities are triggered by changes in others and their environment (Benbya and McKelvey 2006b). In this complex web of relationships, cause and effect logic of dependent-independent variables is not discernible (Lewin and Volberda 1999). A change may occur in all coevolving entities either by direct exchanges or by feedback from the rest of the system (Lewin and Volberda 1999).

McKelvey (2002) distinguishes between vertical and horizontal coevolution. Reacting to a stimulus, agents may be incited to form a horizontal network of mutually-influencing relationships, which can turn into groups with set norms. The horizontal coevolution happens as the agents in the network influence and are influenced by each other and other groups. Vertical coevolution is prompted when groups form under a higher-level agent or group, which

becomes indoctrinated with its own set of standards. Vertical coevolution transpires through bottom-up and top-down influencing. Established organisations in particular rely on top-down directives and bottom-up, emergent adaptations (Vessey and Ward 2013).

3.4.3 Nonlinearity

The birth of the chaos theory spurred the notion of a "butterfly effect" (Lorenz 1963). Nonlinearity is best illustrated by the phrase "Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?" (Lorenz 1972). Nonlinearity leads to a higher rate of change and unpredictability, due to unperceivable feedback trajectories (Anderson 1999; Lewin and Volberda 1999). Coevolution is defined by non-linear relationships, where small changes in input can lead to unproportioned changes in output, and the reverse. Seemly insignificant issues or events can lead to major predicaments (Vessey and Ward 2013). Even the slightest change, in a single variable can dramatically change the behaviour of the system as a whole. A complex system does not equate to a sum of parts, as its boundaries are always changing (Anderson 1999). If the interactions and the behaviour of a system are linear, then the behaviour of the overall system will be simple, or even complicated. However, even a few non-linear parallel processes may lead to complex behaviour of the overall system (Choi et al. 2001). It is for this reason that complex systems cannot be traced through cause-effect logic of linear relationships (Baum and Singh 1994). Therefore, unlike simple systems, complex systems cannot be predicted and controlled (Vessey and Ward 2013). The inability to trace change between independent and dependent variables complicates our understanding of coevolutionary change (Lewin and Volberda 1999). It is for this reason that researchers can only have an impartial understanding of the outcomes of nonlinear relationships (McKelvey 2004a). Platform development, for example is often associated with nonlinear relationships (Tilson et al. 2012).

3.4.4 Emergence

Transcending the notion of a mere assemblage of components, the concept of emergence stipulates that systems possess properties that are not displayed in their constitutive parts (Simmonds et al. 2021). Emergence is considered both a process and a structure. As a process it can result from positive feedback loops, or self-organisation of entities into phase transitions (Benbya et al. 2020) The interactions of lower-level agents can produce new higher-level structures in the organisation (Kozlowski 2000). The interactions between human agents and technical components can also produce complex systems and patterns (Vessey and Ward 2013). In socio-technical systems a phase transition can disintegrate any existing structures, roles and relationships leading to a new state (Benbya et al. 2020). These interactions transpire at the *edge of chaos,* which fosters the emergence of new forms (Vidgen and Wang 2009).

Synchronic emergence captures the emergent dynamics at a point in time, whereas diachronic emergence captures the evolution of a system over time (Simmonds et al. 2021). The notion of *novelty* bifurcates emergence into two kinds: *epistemological* and *ontological,* where the former equates to unpredictable ramifications of micro-level dynamics and the latter refers to the macro-micro relationship, where macro-level effects cause emergent properties in the micro-level and vice versa (Simmonds et al. 2021). Emergent outcomes as a result of socio-technical interactions have been observed if a number of IS studies such as the emergence of micro-strategies in ecosystems (Staykova 2018), creation of collective online order in turbulent environments (Nan and Lu 2014) and the development of IS services (Montealegre et al. 2014).

3.4.5 Path Dependencies

Coevolutionary course is inscribed with historical contingency, serendipity or circumstance, making it path-dependent and irreversible (Allen and Varga 2006). The effects in a specific

context are contingent not only on that context, but others before it. This suggests that at the population level, variations among organisations may manifest as a result of previous heterogeneity in the population, instead of variants in niches in the environment, or due to exogenous conditions (Lewin and Volberda 1999). Improbable events can also lead to permanent structure changes (Baum and Singh 1994).

Adaptation is contingent on history and path dependencies of irrevocable changes and past actions (Koza and Lewin 1998). From an intra-organisational stance, past leadership actions can lead to irreversible effects — a new permanent order (Lewin and Volberda 1999). Because path-dependencies are difficult to change, they can lead to inertia over time (Hanseth and Lyytinen 2010; Rolland 2021). Path-dependent behaviour transpires via *self-reinforcing mechanisms* — where a new order emerges, preferring a certain pattern that is reinforced for a period of time, or *reactive sequences* — where the events in a sequence can be both a reaction to previous events or cause succeeding events (Rolland 2021). For example, in IS the coevolution of systems hinges on adjacent technologies, IT functions and work practices (Hanseth and Lyytinen 2010). Path dependency can lead to technical debt, or the accumulation of technical and informational options during its evolutionary path (Rolland et al. 2018).

3.4.6 Genetic fixation

Coevolution in an organisational context, results in the structural or other permanent change, a concept Porter (2016) refers to as *genetic fixation.* Genetic fixation and replication in entities occurs through a process, or a mechanism that brings about a permanent change. It is for this reason that studies of coevolution require a longitudinal analysis. The biological notion of genetic fixation corresponds to "knowledge fixation" in the organisational context, resulting from strategic initiatives (Porter 2016 p.491). The survival of an organisation is contingent on the internal characteristics most in line with the demands of the external environment. Genetic fixation is the result of these characteristics increasing and eventually prevailing (Parisot 2019).

3.5 Coevolutionary Principles of Mutual Adaptation

Mutual adaptations occur between the coevolving entities and their environment. To use an analogy rats and experimenters simultaneously learn from one another (Baum and Singh 1994). A number of principles for driving coevolutionary dynamics have been recognised by scholars (Han and McKelvey 2008; Montealegre et al. 2014) They are summarised in Table 14 below. Whilst having none is detrimental, having all of the principles greatly encourages coevolution (Benbya and McKelvey 2006a).

Table 14 — Principles of Mutual Adaptation

Principles	Description	References
Adaptive Tensions	As tensions between coevolving entities arise, they seek a resolution, which drives the adaptation process.	(Benbya and McKelvey 2006b; Arikan 2007; Vessey and Ward 2013)
Feedback loops	Coevolution is driven by either positive or negative feedback loops. Positive feedback is a loop of reciprocal interactions	(Lewin and Volberda 1999; McKelvey 2002; Benbya and McKelvey 2006b)

	between entities and their environment, whereas negative feedback is equilibrium seeking.	
Requisite Variety	To evolve the system must have at least the same rate of internal change as that in its external environment.	(Benbya and McKelvey 2006a; Vessey and Ward 2013)
Change Rate	Adaptation can only advance at the rate that exploitable variation becomes available.	(Thomas et al. 2005; Benbya and McKelvey 2006b)
Self-Organisation	Self-organisation is the ability of different agents in a system to evolve into an organised form without external influence.	(McKelvey 2002; Volberda and Lewin 2003; Vidgen and Wang 2009; Vessey and Ward 2013)
Modularity	Modular systems have the ability to be compartmentalised into semi-autonomous parts that can be recombined and evolve at a faster rate.	(Simon 1962; Weick 1976; Benbya and McKelvey 2006a)
Decomposition	Disintegrating components from a whole into semi-autonomous parts that can evolve at a faster rate.	(Schilling 2000; Agarwal and Tiwana 2015)
Oscillation Dynamics	Opposing dualities alternate with an irregular rhythm. Managing opposing dyads enables order creation.	(Dumont 1966; Thomas et al. 2005; Benbya and McKelvey 2006a)
Synchronisation of Exploitation and Exploration	Achieving a balance between optimising operations (exploitation) and the pursuit of new strategic directions (exploration).	(Volberda and Lewin 2003; Vidgen and Wang 2009; Vessey and Ward 2013)

3.5.1 Adaptive Tensions

Drawing on the *"energy differential"* physics concept (Lorenz 1963), McKelvey (2001) introduced the term *adaptive tensions* to explain a transformation from one state to another in organisational science. The tensions can arise in both the external, or the internal environment (Vessey and Ward 2013). Coevolution is initiated by these adaptive tensions between coevolving entities in an organisation (Benbya and McKelvey 2006b). If adaptive tensions are low, the system exhibits equilibrium and predictability, with very little novelty. A moderate level of tensions will propel a system into the *edge of chaos*, never reaching full stability, but not

descending into chaos either (Benbya et al. 2020). Irregular, non-routine actions can generate tension, if amplified above a threshold value, which marks emergent complexity (McKelvey 2004a; Arikan 2007). High levels of complexity might result in chaotic outcomes, marked by unpredictable patterns (Benbya et al. 2020). Given that tension demands resolution, this in turn generates an adaptive response to increase order in the system (Arikan 2007).

3.5.2 Feedback Loops

Coevolution can be a result of either positive or negative feedback (Benbya and McKelvey 2006b). Negative feedback loops are "deviation-counteracting", while positive feedback loops are "deviation-amplifying" (Maruyama 1963; McKelvey 2002). To wit, positive feedback loops reinforce change, while negative feedback loops diminish it (Baum and Singh 1994).

Positive feedback loops can be described as the engine of the adaptation process (McKelvey 2002; Benbya and McKelvey 2006a), driving nonlinear relationships between input and output (Anderson 1999). When propelled by positive feedback loops, a change in a variable has a reciprocal impact on another (Baum and Singh 1994; McKelvey 2002). In organisations, when an element adapts to its environment, the environment and the other elements in it follow suit, resulting in continuous change (Vessey and Ward 2013). In other words, the interactions between the organisation and the environment are recursive and bidirectional, as opposed to unidirectional, as in cause and effect relationships (Lewin and Volberda 1999). In IS development, positive feedback loops have been described as "development spirals", where initial requirements evolve into powerful new structures, based on stakeholder input continuously being addressed

Negative feedback, as a control mechanism aims to establish equilibrium, or balance (Benbya and McKelvey 2006b). For example, a traditional software development cycle will aim to close the gap between expectations and the status of IS development, by always reverting to preconceived goals. This approach aims to extinguish the effects of emergence (Vidgen and Wang 2004). Negative feedback imposed by the external environment, coupled with internal, organisational constraints dampen the adaptive process (Sandberg et al. 2020). The concept of equifinality indicates systems initiated from different causes can end up in similar states. That is, goal-oriented systems, under negative feedback conditions can result in similar states regardless of antecedent conditions and being exposed to environmental factors. An example of a negative feedback system is a thermostat (McKelvey 2002; McKelvey 2004a)

3.5.3 Requisite variety

As systems evolve, their complexity rises, as a result of the growing complexity in the environment (Vessey and Ward 2013). Grounded in Ashby's (1956) *Law of Requisite Variety*, to evolve a system's internal rate of change must match or exceed the rate of change in the external environment. Ashby (1956 p. 207) states that only "variety can destroy variety". Boisot and McKelvey (2005 p. 27) extend this concept to complexity, postulating that "only complexity can destroy complexity". Consequently, they rename the initial Law of Requisite of Variety to the Law of Requisite Complexity.

Environmental perturbations can be managed or annihilated by raising internal complexity to the same level as the external complexity (Benbya and McKelvey 2006a). The ability to generate sufficient change depends on agent heterogeneity. If the heterogeneity of agents diminishes, their ability to adapt to uncertainties posed by the external environment also diminishes (McKelvey 2002). Since it cannot be predicted how much variety is required upfront, organisations should strive for "excess diversity". In a world where change is often unanticipated, frequently the law of excess diversity prevails. That is, for a system to coevolve

its internal diversity must match or exceed that of the external environment. That means more diversity is required to function in the future than is required in the present (Allen 2011). Boisot and McKelvey (2005) provide an illustrative example of human sense-making. As agents scan their environment for changes, they acquire data. By analysing the links between data, the data is then transformed into information, and as this information produces patterns, agents can use that knowledge to take action. This is an example of achieving requisite variety.

3.5.4 Change Rate

This principle is based on Fisher's Theorem of Natural Selection, which stipulates that the rate of adaptation is proportional to the rate of variation. The law states: 'the rate of increase in fitness of any organism at any time is equal to its genetic variance in fitness at that time' (Fisher 1930 p.35). At the fundamental level the theorem explains how the adaptive potential of a population changes over time, as its genetic variance increases (Okasha 2008). As the variance increases, so does the range of genetics available for selection (Kock and Chatelain-Jardón 2011). For example, an organisation's competitive advantage is dependent on the organisation evolving at a more rapid rate than its competition. Increasing the ability of organisational units to adapt fosters the competitive advantage, while bureaucratic structures are typically perceived as slow to adapt (Thomas et al. 2005).

3.5.5 Self-Organisation

One of the main arguments of complexity theories is that the internal structure of a complex adaptive system can change and evolve without the interference of an external designer or a centralised authority. In that vein, "this process is such that structure is neither a passive reflection of the outside, nor a result of active, pre-programmed internal factors, but the result of a complex interaction between the environment, the present state of the system and the history of the system" (Cilliers 1998 p.89). In the context of organisations, self-organisation is the ability of distinct, semi-autonomous agents to evolve into an organised system or pattern without external influence, such as managerial control (Vidgen and Wang 2009; Vessey and Ward 2013). As such, it requires a departure from the traditional command and control philosophy to empower the lower levels of the organisation to exercise more control (Volberda and Lewin 2003; Vessey and Ward 2013). Self-organisation is a multilevel process that can generate new patterns of order creation at the collective level (McKelvey 2002; Nan and Lu 2014).

3.5.6 Modularity

The principle of modularity is grounded in Simon's (1962) depiction of complex systems as hierarchic systems, made up of subsystems that are in themselves systems of lower-level components, until the ability for further disintegration is exhausted. Hierarchical systems are all around us, whether social systems (e.g. organisations made up of departments and teams), biological systems (e.g. with cell as the smallest component) and physical systems (e.g. atoms and molecules as the smallest components). The hierarchies can intersect, where a component can be a part of multiple systems (e.g. an individual can be a part of a family, an organisation or a school). Therefore, the boundaries of a system and its context do not remain fixed — its identity is determined by the level of analysis. For example, an organisation is embedded in an industry and the industry is embedded in the context of an economy (Schilling 2000).

Reinforcing the theory of decomposable systems, Weick (1976) introduced the concept of *loosely coupled systems.* Loosely coupled systems can be assembled in different ways or disassembled without affecting the other parts of the system. The evolution of the system is

dependent on the rules imposed by the system architecture, which can either enable or inhibit the recombination of components.

Modularity therefore refers to the extent to which the components of a system can be detached and recombined, based on the level of coupling between the components. Modularity enables diverse semi-autonomous components to be restructured into heterogeneous arrangements. A high degree of modularity occurs when components can be disintegrated and recombined into new arrangements. The more diverse the new arrangements, the more likely the system will be able to adapt to a high rate of change in its environment. This is possible due to the flexibility enabled by an increase in the number of possible combinations in the system (Schilling 2000). As the complexity of the system is increased through variation, so is the rate of its adaptive response (Clegg et al. 2006). It is for this reason that a modular system may be better equipped to adapt to the changes in its environment (Mooney and Ganley 2007).

The concept of modularity has been applied to product design (Sanchez and Mahoney 1996), organisations (Weick 1976) and information systems (Vidgen and Wang 2009; Tiwana et al. 2010). Modular product design is one that consists of a number of interrelated components that are governed by rules. These components and specifications collectively make up the product. Integral product architectures on the other hand are tightly coupled and contain interrelated mapping between functional elements and physical components. In such design, changes to one component may have a flow on effect on the others (Yoo et al. 2010).

In the same way, a modular organisation is one where units in the organisation are autonomous and aligned with the modular product architecture (Sanchez and Mahoney 1996; Yoo et al. 2010). Organisations designed in this way "continuously change and solve problems through interconnected coordinated self-organising processes" (Daft and Lewin 1993 p.1). Integral organisational structures focus on innovation within a single firm, whereas modular structures, distribute innovation within a network of firms (Yoo et al. 2010). Balancing the increasing variety stemming from innovation with modularisation of architectures is required to avoid chaos. Business modularity, in contrast to business silos is the most adaptable stage of enterprise maturity, characterised by a centralised IT function and platforms (Ross et al. 2006). Modularity in both organisational structure and information systems is necessary for the ability of socio-technical systems to evolve (Henfridsson and Bygstad 2013).

In the context of information systems, modularity is the ability to achieve reconfigurability, or the ability to add, modify, remove or recombine components through principles of loose coupling without affecting the functionality of the system (Montealegre et al. 2014). Historically IS systems were not able to evolve due to tight coupling of components. Due to this lack of adaptability, when major changes were required, the whole system would need to be discarded. This shortcoming has been overcome by applying principles of modular design to manage the complexity more effectively. This allows "components to be removed, replaced and reconfigured in a more dynamic fashion" than that of tightly coupled monolithic systems (Benbya and McKelvey 2006a).

3.5.7 Decomposition

Although closely related, modularity and decomposition are not interchangeable concepts (Agarwal and Tiwana 2015). While the overall theme of modularity is integration through different configurations, the theme of decompositions is disintegration. Once disintegrated, it must be considered whether the components will function when put together again, as a whole. In biological systems this may not hold true, but in material systems, disintegrating and integrating components may preserve their functional, although not in the same way (Schilling 2000). Parts that possess a high degree of autonomy can adapt at a faster rate (Simon 1962).

3.5.8 Oscillation dynamics

Organisational complexity gives rise to a myriad of dyad tensions, such as collaboration-control, individual-collective, flexibility-efficiency, exploration-exploitation, profit-social responsibility, cooperative-competitive, mechanistic-organic and centralised-decentralised themes (Smith and Lewis 2011). Others include formal vs. informal authority, top-down control vs. bottom-up autonomy, (Benbya and McKelvey 2006a), exploration vs. exploitation (Vidgen and Wang 2009), and more recently in the digital ecosystem context control vs. generativity (Ghazawneh and Henfridsson 2013). The paradoxical nature of these opposing forces renders them irreconcilable, making them coexist in a dynamic equilibrium (Smith and Lewis 2011). As they cannot be resolved they need to be managed to create order in an organisation.

These poles of duality alternate with an irregular rhythm (Thomas et al. 2005). The notion of rhythmic oscillation stems from Dumont's (1966) entangled hierarchy theory, later described as *"coordination rhythm"* (Benbya and McKelvey 2006a pp. 26-27) and *"circular organising"* (Thomas et al. 2005p. 2). The alternating patterns perform adaptive responses, akin to a pendulum, with oscillations alternating irregularly. The circular organising concept stemmed from organisational studies suggesting firms can switch between hierarchical and network organisational structures (Ackoff 1989).

For example, in IS development projects, tensions between the top-down stakeholder directives and bottom-up autonomy of IS experts may eventuate in ongoing dualities of influence between the two coevolving entities. Instead of seeking resolutions to these tensions, organisations can concede that they are inevitable. To manage them, each opposing pole should be empowered at different intervals for adaptation to succeed (Benbya and McKelvey 2006a).

3.5.9 Synchronisation of Exploitation and Exploration

The simultaneous balancing of exploitation and exploration has been recognised as a coevolutionary principle (Volberda and Lewin 2003; Vidgen and Wang 2009; Vessey and Ward 2013). It is often referred to as *ambidexterity* (Montealegre et al. 2019). Exploitation strives for the achievement of operational improvements and stability, by focusing on shorter-term goals and the use of existing resources (Volberda and Lewin 2003; Vessey and Ward 2013). It is often concerned with standardisation, routinisation and cost optimisation. Exploration, on the other hand is more concerned with strategic pursuits, such as innovation and knowledge creation. (Lewin and Long 1999; Vidgen and Wang 2009). It is focused on longer-term goals and seeking out new opportunities (Vessey and Ward 2013).

Long-term sustainability hinges on an adequate balance between the two. Too much focus on exploitation could be detrimental to the longevity of the organisation. Yet, too much exploration could come at the expense of stability (Volberda and Lewin 2003; Vessey and Ward 2013).

In this chapter, I presented the theoretical foundations underpinning this research. I also argued the relevance of the coevolution theory for my research and the limitations of past theoretical lenses applied in the study of DT through platformisation. Next, I take a look at the methodology used in this study.

Chapter 4: Methodology

In this chapter, I present the methodology employed for this study. I start by positioning the research, as a qualitative, interpretive study. I then proceed to provide a justification for the chosen methodology. Next, I discuss the philosophical assumptions underpinning the interpretivist paradigm. Following this discussion, I introduced the method employed for this research — multi case study. Then, I go on to provide a conceptualisation of mechanisms, one of the foci of this research. Next, I describe my rationale for the selection of the case organisation, as well as the research context, including the three cases studied. Finally, I discuss the data collection and data analysis approaches undertaken.

4.1 Positioning the Research

This study adopts a qualitative approach for studying the research phenomenon of DT through platformisation and a multi case study method of enquiry. Qualitative research is appropriate for exploring phenomena in their natural context, as opposed to quantitative methods, which tend to measure certain aspects of a phenomenon (Recker 2012). Qualitative research has a long-standing tradition of being revelatory in nature (Gioia et al. 2012). As such, it is well-suited for emergent topics that are exploratory in nature and organisational phenomena in general (Myers 2013).

In contrast to quantitative research, appropriate for studying natural phenomena, qualitative research emerged in social sciences to study social and cultural phenomena. To wit, it acknowledges that what sets humans apart from the natural world is their ability to communicate through language, and it is this language that guides us in understanding and explaining phenomena. Hence, any attempt to quantify textual data would lead to a loss of meaning (Myers 2013). Researchers are advised to select a paradigm that is in line with their underlying assumptions and beliefs about the nature of reality (Levers 2013). This research is grounded in the socio-technical ontological and interpretivist epistemological paradigms.

4.2 Justification of Methodology

The socio-technical nature of information systems is appropriate for interpretivist research, with the main method for such enquiry being an in-depth case study over a longer timeframe (Walsham 1995b). As such, this was the appropriate method to study the phenomenon of DT through platformisation in the organisational context, over a period of 18 months. Moreover, case studies are suitable for unique, contextual phenomena, such as the one under investigation, where the extant literature does not provide much insight. Case studies are particularly appropriate for answering the "how" and "why" questions (Myers 2013).

As such, this method was deemed suitable for answering my research questions. The overarching research question: "*How can organisations achieve DT through platformisation?"* required a focus on the organisational context and a case study provides the best way to elicit that information. The first sub-question: "*Through which mechanisms does DT through platformisation occur?"* required me to immerse myself in the given context, focusing on the different levels in the organisation and its environment. As such, the case study method allowed me to observe the mutually-shaping interactions that contribute to the phenomenon, in order to illuminate the mechanisms. The second sub-question: "*What are the organisational outcomes of DT through platformisation?"* required me to focus on the higher-level organisational outcomes of DT through platformisation, which occurred over time within the given context.

This research adheres to the criteria recommended by Myers (2013) for selecting a case study method, which is summarised in Table 15 below.

Table 15 — Justification of Methodology

Criteria	Evidence
Must be interesting	DT through platformisation is an interesting and timely phenomenon, especially in light of the current accelerated digitalisation in society.
Must have enough evidence – such as using verbatim quotes to strengthen the argument	Verbatim quotes were used throughout the Findings section.
Must be complete – all evidence to prove or disprove theory	The iterative data analysis described above is reflective of the rigour adopted to ensure the completeness of the research.
Consider diverse perspectives, even contentions	A diverse range of participants were selected from multiple areas and levels of the organisational hierarchy.
Well-written narrative	Care was taken to write a detailed narrative in the Findings section to reflect the richness of the data.
Contribute to scientific knowledge	Makes a scientific contribution by addressing a relevant topic and developing a theory supported by empirical evidence.

For this research, I selected multiple cases within a single organisation (three digital platforms). All three contributed and continue to contribute to the organisation's DT through platformisation journey. This approach, like experiments has the ability to replicate, contrast and extend theory (Eisenhardt and Graebner 2007). Multiple cases can be useful for solidifying findings, by reinforcing patterns, and as such the robustness of the study (Recker 2012). As such, they can provide more diverse empirical evidence, and a wider scope of exploration and theoretical elaboration (Eisenhardt and Graebner 2007).

The main method of data collection were semi-structured interviews. This approach provided more flexibility than structured interviews, with a predefined set of questions in a certain order. Unstructured interviews, on the other hand allow participants to talk more freely, which can end up in a lot of irrelevant data, or inversely, not enough data, forcing the researcher to improvise. Hence, semi-structured interviews are considered the best of both approaches (unstructured and structured) (Myers 2013).

Indeed, while the questions were prepared in advance, I did not strictly adhere to the order of the questions, allowing the conversation to flow more freely, whilst still having the control to steer the conversation. This also allowed for new sub-questions to emerge to clarify concepts, and open up new lines of enquiry, within the boundaries of the given topic. Although Myers

(2013) argues that there is no ideal number of interviews, others recommend a minimum of 15 to reach theoretical saturation (Pan and Tan 2011). I was fortunate to get access to 30 unique participants and 31 interviews in total, contending that this was a sufficient number to gain enough insight to answer my research questions.

4.3 Philosophical Foundations

The choice of methodology is grounded in the researcher's epistemological and ontological assumptions (Corbin and Strauss 2008). "Ontology is the study of being. It is concerned with 'what is', with the nature of existence, with the structure of reality as such" (Crotty, 1998, p. 10). Hence, ontological assumptions are concerned with the nature of reality. Epistemology, on the other hand, is "a way of understanding and explaining how we know what we know" (Crotty, 1998, p. 3).

The ontological stance regarding the organisation and its information systems adopted in this thesis is a socio-technical one. Researchers bewail the continuing discounting of the material aspects of organisational change, including information systems. The unique material properties of IT initiatives render them different to other types of organisational change. The socio-technical perspective adopted distinguishes between social and material (technical) constructs, but recognises their close relation, not favouring one or the other. This ontological stance validates the "viability of a socio-technical approach in which the ontological distinction between social and technical reality is maintained" (Robey et al. 2013 p.385). The socio-technical perspective is considered the guiding paradigm in IS (Sarker and Chatterjee 2013). This perspective is complementary to coevolution theory, based on the premise that entities (human agents and technology) maintain a degree of autonomy, but continually influence each other through their reciprocal interactions.

This study adopts an epistemological interpretivist paradigm, grounded in the assumption of a socially constructed reality (Myers 2013). Protagonists of the interpretive paradigm contend that objective reality is elusive and unattainable, opting instead for identifying patterns, interpreting and narrating the collective meaning of the individual human expression (Levers 2013). To wit, for interpretivists reality is ultimately subjective, rooted in a shared meaning between participants in a particular context (Orlikowski and Baroudi 1991; Cecez-Kecmanovic 2011). In contrast, positivist studies rely on 'external realism' – the view that reality is independent of the human construction of it (Walsham 1995a).

The interpretivist research does not set out to test a hypothesis or formulate propositions upfront. It is therefore not concerned with predefining independent and dependent variables (Myers 2013). A distinguishing feature of the interpretivist research is the 'thick description' (Walsham 1995a p.75). Thick descriptions manifest through grasping of complex concepts, by uncovering their hidden meaning and having the ability to present them to others. The purpose of interpretivist research is to present interpretations of phenomena, not the universal truth or laws. Interpretivism draws on two branches of philosophies — non-positivism (the notion that facts and values are inextricable and constitute scientific knowledge), and normativism (scientific knowledge being reliant on social factors) (Walsham 1995a). Interpretivist research is oriented towards theory building, rather than theory testing, which is the premise of positivist, quantitative research (Myers 2013). For theory building to take place, relevant concepts must be identified for the purpose of description, explanation and prescription (Gioia et al. 2012).

Irrespective of the underlying philosophical paradigm, theory plays a fundamental role in any research (Walsham 1995a). Both proponents of positivist (Eisenhardt 1989a) and interpretivist (Walsham 1995a) research agree on the following three ways to use theory:

1. To guide the research design and data collection – creating a theoretical framework from the literature. There is an associated risk with this approach in forming presumptions and using the theory rigidly without recognising new concept that arise, which do not fit the theory
2. As part of the recursive process of collecting and analysing data – modifying the initial theoretical lens in some way
3. As the final result of the research – the final result may be "theoretical constructs, propositions and/or midrange theory" (Eisenhardt and Graebner 2007 p.25). However, Eisenhardt and Graebner (2007) argue that midrange theory should be tested using positivist approaches, which is not suitable for interpretivist research (Walsham 1995a).

In this research, I used the theory of coevolution, according to the points above. The theoretical lens guided my data collection and analysis, for the purpose of expanding my theoretical lens, while at the same time maintaining awareness of not being constrained by it. Theory is also the final product of this study — by drawing on coevolution theory as well as my own empirical findings. I constructed a theoretical model, including a theoretical framework of mechanisms of DT through platformisation, as well as a set of propositions.

4.4 Method

Interpretivist case studies call for a reflection on the role of the researcher, the interview process and the reporting of the findings (Walsham 2002). Since the interpretivist approach enables the research to explain human reasoning and actions in organisational contexts it is well suited for information systems phenomena (Klein and Myers 1999). As such, this particular choice of methodology allowed me to collect rich empirical data, and to formulate the subsequent theorisation in order to answer my research questions. An interpretive researcher has the task of interpreting the participants' responses through their own reasoning and to present these findings to an audience. I undertook the role of an 'outside observer', as opposed to an 'involved researcher' taking intervention or observing the participants. The advantage in this situation is the likelihood that participants will be more open and transparent, without withholding their views, because the researcher does not have a personal interest at stake. On the downside, access to data can be harder to obtain, if regarded as sensitive or confidential (Walsham 1995a p.77). The researcher relies on the basic assumption that we can recognise relationships and patterns in the data, to allow us to interpret and present theoretically-grounded concepts (that is, see the bigger picture), collated from the individual perspectives of our participants (Gioia et al. 2012).

Generalising through statistical means is impossible with case study research and that is not its aim. Because sampling logic and statistical validity is not appropriate for this type of research, even doing a single case study is considered sufficient (Myers 2013). The insights gained through interpretivist case study research are situated in a given IS context. However, they may apply beyond their immediate context, to other types of organisations and contexts in future studies (Walsham 1995a). Therefore, case studies are not a choice of methodology, but a choice of what is to be studied — that is, they provide insights about a new phenomenon (Thomas 2010). Hence, generalising is achieved by drawing inferences from empirical findings to theoretical constructs (Yin 1994). This is realised in the form of "the development of concepts, the generation of theory, the drawing of specific implications, and the contribution of rich insight" (Walsham 1995a p.79; Walsham 2002).

Constructs such as 'validity' or 'reliability' in positivist research are not a part of the interpretivist quality evaluation (Myers 2013). As such, providing 'thick descriptions' of how

conclusions were reached is at the crux of interpretivist case study research (Walsham 1995a p.75). Interpretivist criteria is based on the hermeneutic approach. “Interpretive research does not predefine dependent and independent variables, but focuses on the complexity of human sense making as the situation emerges” (Klein and Myers 1999 p.69). Hence, case study research should be evaluated according to its own rules and not the rules of another method. There is often a trade-off to consider between rigour and relevance. Rigorous research is considered as adhering to scientific standards, peer reviewed and published in an academic journal. Case study research has potential for both rigour and relevance by studying real situations, and is in no way inferior to laboratory experiments (Myers 2013). Following Guba and Lincoln’s (1989) criteria for qualitative research, I demonstrate the strategies employed in this study in Table 16 below.

Table 16 — Ensuring trustworthiness of data

Criteria	Purpose	Strategies employed in this study
Credibility	To demonstrate the trustworthiness of the findings	• Ongoing engagement with the participants over an 18 month period • Triangulation of interview transcripts with other materials • Selecting participants based on their ability to provide information on the topic
Transferability	To demonstrate the applicability of the findings in other contexts	• Providing rich descriptions to allow the reader to discern whether the findings are applicable in another context
Dependability	To demonstrate the findings are consistent and can be easily reproduced	• Triangulation of interview transcripts with other materials • Confirming concepts with multiple participants to ensure a common understanding
Confirmability	To demonstrate that the findings are free of bias and verifiable	• Selecting different participants for the study from different levels in the organisational hierarchy • Ongoing reflective practice

Adapted from (Guba and Lincoln 1989)

Having given an overview of the case study method, I proceed to conceptualise mechanisms, as one of the foci of this research.

4.5 Conceptualising mechanisms

In many fields, scientific discovery hinges on the development of mechanisms to explain a phenomenon. Philosophy and science, both natural and social are concerned with the development of mechanisms. Material systems (e.g. physical, biological, chemical or technical), social or cognitive are believed to be made up of mechanisms. Yet, there is no common consensus as to what constitutes a mechanism (Machamer et al. 2000; Bunge 2004). The lack of common lexicon regarding mechanisms has resulted in the loose application of the term, often being implied from the literature without being empirically supported (Hanelt et al. 2020). Mechanisms have been described as processes that make the system "what it is" (Bunge 2004 p.182). They comprise of entities and the activities they instantiate which generate change (Machamer et al. 2000). It is important to highlight that mechanisms are also parts of complex systems (e.g. competition or negative feedback) and not just their individual parts.

This view recognises that the components in the system are defined by their relationships to other parts in the whole. If a subpart is detached from the whole, it "ceases to be what it is" (DeLanda 2006 p.13). A broadening of Machamer's et.al. (2000) definition reflects this more complex conceptualisation of mechanisms, as constituents of collections of entities including their properties, interconnected through relations that bring about changes to the properties of entities and the relations between the entities and their environment (Thagard 2007)**.** Relations between parts are integral to the formation of emergent properties. Without them, a system is a mere amalgamation of components and properties. Although it can be broken down into separate parts, at the same time it will possess irreducible properties, formed through the process of emergence (DeLanda 2006).

This is consistent with the complexity perspective which argues "a system is a complex object whose parts or components are held together by bonds of some kind. These bonds are logical in the case of a conceptual system, such as a theory; and they are material in the case of a concrete system, such as an atom, cell, immune system, family, or hospital. The collection of all such relations among a system's constituents is its structure (or organisation, or architecture)" (Bunge 2004 p.188). Moreover, there can also be the existence of parallel mechanisms in a systems, some essential and others non-essential (Bunge 2004).

Proponents of social mechanisms focus on the perceivable relations between events, describing mechanisms as a "unique chain of events that lead from one situation or event to another" (Hedström and Swedberg 1998 p.3). Mechanisms can be broken down into a triad according to the observed level they are encompassing. These include macro to micro, micro to micro and micro to macro relations. A macro to micro mechanism establishes how the conditions at the macro level affect the micro level processes in the organisation. Micro to micro mechanisms determine how the macro level change is absorbed, and finally micro to macro explains how actions and interactions at the micro level shape macro level outcomes (Hedström and Swedberg 1998).

Mechanisms are considered imperceptible and consequently need to be discovered (Bunge 2004). They are useful in explaining how phenomena emerge, or how a process works (Machamer et al. 2000). The value of mechanisms is their explanatory, not just descriptive power. They play an important part in middle-range theories. A mechanism acts like a hypothesis or a set of hypotheses about a phenomenon (Hedström and Swedberg 1998). Mechanisms have been derived through a number of different methodological approaches in

the IS discipline, ranging from interpretivism (Marjanovic 2021), critical realism (Henfridsson and Bygstad 2013), agent-based modelling (Zhang et al. 2020) and the Delphi method (Nambisan and Tanniru 1999).

In natural sciences, theorisation happens across three stages where phenomena are identified, explained and tested, and generative mechanisms present are described. The difference in social sciences is that social structures are not separate from human actions and interpretations, and their generative mechanisms are confined to a particular time and space. Therefore, mechanisms in the social sciences can be described as 'tendencies'. They can be useful for describing the past, but not making predictions (Walsham 1995a p.79). Prediction is usually linked to theory testing (Gregor 2006).

Due to my interpretivist stance, I refrain from any claims of causality in describing the mechanisms of DT through platformisation. Consequently, the stance on mechanisms adopted in this research is teleological rather than causal. According to the Oxford dictionary, teleology in the philosophical sense is the explanation of phenomena in terms of the purpose they serve rather than of the cause by which they arise. Developing theory in this way is more focused on the relationships rather than causality, determined by “law-like generalisations or statistical association”(Gregor 2006 p.618).

Consistent with my theoretical lens, I acknowledge that mechanisms can also be a result of emergence (Bunge 2004; DeLanda 2006). Proponents of Hagel consider emergent properties to only be instantiated through the interactions between the components in the whole and not its amalgamation of the components’ properties (DeLanda 2006). In this thesis, I adopt Hedström and Swedberg’s (1998) conceptualisation of mechanisms, which has been broadened to emphasise the socio-technical nature of IS as the “interaction between social and technical elements” (Henfridsson and Bygstad 2013 p.11). Indeed, mechanisms may manifest through both human agency and technical functions to achieve outcomes (Gregor et al. 2020). As previously mentioned, I make a distinction between processes and mechanisms in this thesis. While mechanisms yield regular changes, processes are a larger product of such cumulative change (Delgado 2022).

I conceptualise the digital platform level as the micro level and the strategic level (affected by the external environment) as the macro level. Hence, coevolution is perceived as a top-down and bottom-up process of adaptation in the organisation. Although the micro level can affect the macro level state (beyond an organisation’s boundaries) (Maitlis and Sonenshein 2010), that is outside the scope of this research. My intention was to derive the mechanisms of DT through platformisation by focusing on the reciprocal interactions between two levels (strategic and digital platform levels) and their environment, but not to predict their behaviours. DT through platformisation is considered here as a process, which is a result of cumulative changes produced by the mechanisms. Having discussed the nature of mechanisms I focus on in this thesis, I now move on to describe my selection criteria for the case organisation and the three cases of digital platforms selected.

4.6 Case Organisation Selection

The higher education sector was chosen as a prime example of an industry going through a profound DT. The overall rise in digitalisation in the recent years has been changing student expectations. Further pressures for this sector to adapt have come from online learning platforms. The need for DT has been further accelerated during the COVID-19 pandemic.

The institution selected for the study needed to be a higher education institution of considerable standing. This is to fulfil the criteria of the organisation being an established organisation and not in a nascent industry, such as MOOCs, or an online learning platform, or

a private university that has been in existence for a shorter amount of time. Focusing on an established institution provided enough complexity to observe the process of DT through platformisation. This is because established universities are more traditional and rooted in historical practices, with a typically rigid culture. This provided an appropriate setting for observing DT as changes to technology, work practices, business processes, as well as the overall organisation and its management. The final criterion was the university's active move towards digital platforms, as a means of achieving DT.

According to this criteria, AU-U (pseudonym) was selected as a suitable example of an established university, paving the way for DT through industry collaboration and investments into digital platforms. The COVID-19 pandemic has not only accelerated AU-U's DT efforts, but also put it in an auspicious position to grapple with the challenges and the aftermath of the pandemic.

Followed Walsham's (1995a) recommendations for reporting interpretive research, I used the following guiding principles for choosing the case organisation and reporting on the research findings:

- Providing details of the case organisation
- Justification of why a case study was chosen
- Presenting the number of interviewees and their roles
- Describing what other data sources were used
- Specifying when the research was conducted
- Describing how interviews were recorded and analysed
- Explaining how the recursive process of data collection and theory generation transpired

4.7 Research Context

AU-U is a mid to large, public university in Australia, hosting approximately 46 000 students (including approximately 14 000 international students), 4500 staff members and 7000 researchers. The IT department overseeing the many emerging digital platforms at the university employs around 300 staff. It is a multi-campus, multi-faculty and multi-school university, supporting the core functions of teaching, learning and research, as well as social and administrative functions. It has a strong focus on entrepreneurship, industry and government collaborations. Its courses span a number of disciplines for both undergraduate and postgraduate study, ranging from classical to more incipient disciplines. AU-U has made a number of investments into its research facilities to enable multi-disciplinary collaboration within the university and with external stakeholders. The university prides itself on its social justice agenda both within its environment and the broader society.

A part of its longer-term strategy is a focus on an ambitious mission to significantly improve its rankings and global impact. The international student market makes up a significant part of its revenue stream. The events of the COVID-19 pandemic and the subsequent travel restrictions have led to budget cuts and forced the university to seek alternative sources of revenue.

4.7.1 Overview of the Cases

In this thesis, I focus on three digital platforms as examples of DT through platformisation at the university, each with different observable outcomes. There are many different platforms in use across the university and these three cases represent a subset of the overall landscape. For practical reasons three digital platforms were chosen for the purpose of this thesis. The cases were selected according to the following criteria:

1) Each digital platform had to operate in a different functional area of AU-U (although overlaps exist). This provides a richer perspective on the DT through platformisation journey
2) It had to be a new digital platform or in the process of transformation.

This led me to select the three cases described in Table 17 below.

Table 17 — Overview of the cases

Case	Description
Alpha	A digital platform consisting of an eclectic array of modules, supporting the Teaching, Learning and Administrative functions. It is used by academic and professional staff, as well as students. It supports the core university processes and day-to-day activities.
Beta	A digital platform designed to uplift the university's research function. It provides an improved user experience by integrating research related modules into a single point of access, delivering digital training, improving administrative and business processes, and facilitating better collaboration across the Research function.
Gamma	A digital platform enabling new digital value propositions. Deviating from the university's core offerings, it provides micro-credentials and shorter forms of learning.

Although a digital platform in commonly represented as consisting of a core and a set of interrelated peripheral modules in the literature, the reality is a lot more complex for many incumbent organisations including AU-U. Many cloud-based enterprise platforms and micro-services are in use at AU-U, as part of its infrastructure. To that end, while each digital platform is a constellation of different digital platforms shared across the university, for conceptual clarity and brevity the different components in the digital platform are referred to as modules in this thesis. The majority of modules referred to here by pseudonyms are digital platforms, or micro-services offered by third-party vendors. The digital platforms can be extended through third-party, or other vendor modules. The micro-services are also easily integrated via APIs. Due to their fluid boundaries, unlike traditional IT systems, a number of modules are shared between the digital platforms. The university procured an integration platform to facilitate better integration between the domains and to simplify its technical landscape. Figure 4, Figure 5, and Figure 6 below depict the digital platforms from an architectural standpoint.

4.7.2 Case Alpha

Platform Alpha emerged spontaneously following AU-U's implementation of a cloud strategy, with a mission to streamline the technical landscape by incrementally replacing legacy systems and applications with cloud-based SaaS modules, referred to in this thesis by pseudonyms. Although some modules are used in the teaching and learning context and support students and academic staff, others are used by professional staff for their daily activities.

Architecturally, the digital platform consists of a number of modules, including a learning management module, referred to here as HighEd-M, a CRM module, a digital library and productivity (Collab U) and collaboration (Chat U) modules, as well as a workflow management module. The modules can be further extended through application programming interfaces (APIs) by integrating third-party offerings. Two legacy system for student management and curriculum management are used in conjunction with the digital platform. The university is still searching for viable alternative, new digital platforms to replace these systems in the future.

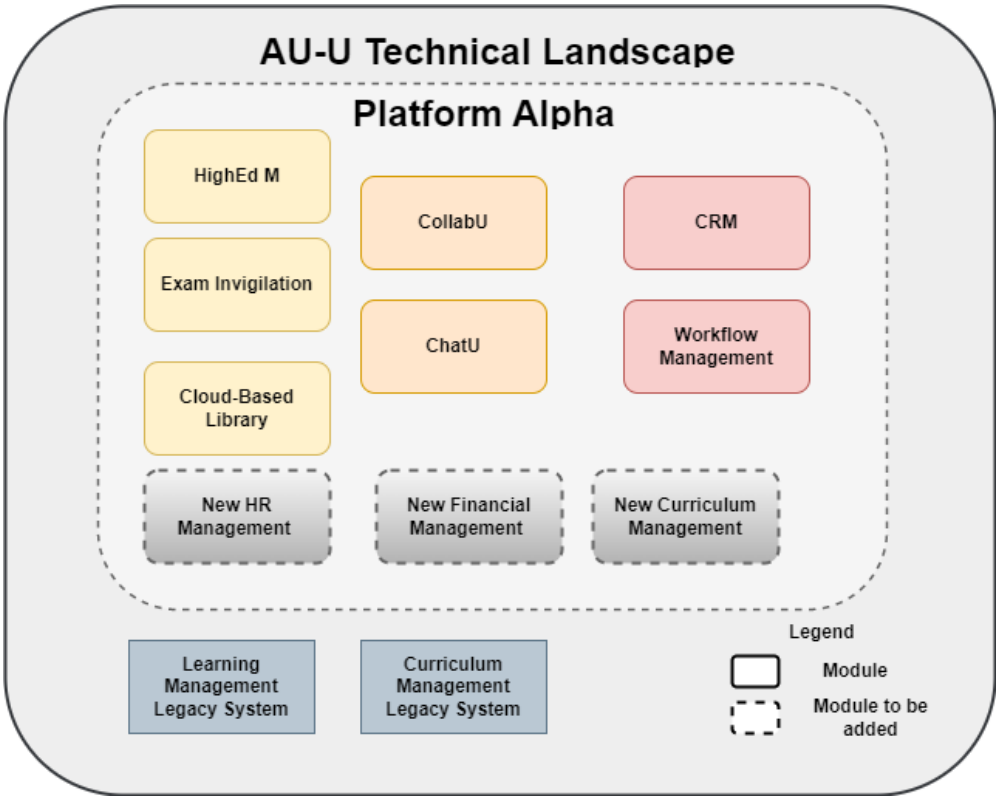

Figure 4 — Illustration of platform Alpha

4.7.3 Case Beta

Platform Beta is a nascent, evolving digital platform introduced to uplift and unite the university's research function. Being a public university AU-U is committed to conducting quality, impactful research for the overall benefit of the broader society, economy, and the environment. Over the past decade, significant investments have been made into physical facilities and academic development to support this vision. This has resulted in numerous research projects, partnering with organisations across multiple industries.

Platform Beta aims to offer expertise and support for researchers across AU-U. This includes providing training in the form of digital content, hosting events, supporting research activities, projects and fostering collaboration across the university. Platform Beta consists of a physical space for delivering events, providing facilities for research and collaboration.

The digital platform is a single point of access for multiple parties at the university, including researchers and academics, professional staff, HDR staff and students. It is currently an internal digital platform. However, the longer-term vision is to open it up to external partners and industry collaborators.

The digital platform consists of a content management module, a media creation module and a third-party events management module integrated via an API. It is inter-linked to other university modules such as the CRM module, HighEd-M and auxiliary research-related modules. Initially launched offering only basic functionality, Platform Beta continued to evolve with each iteration.

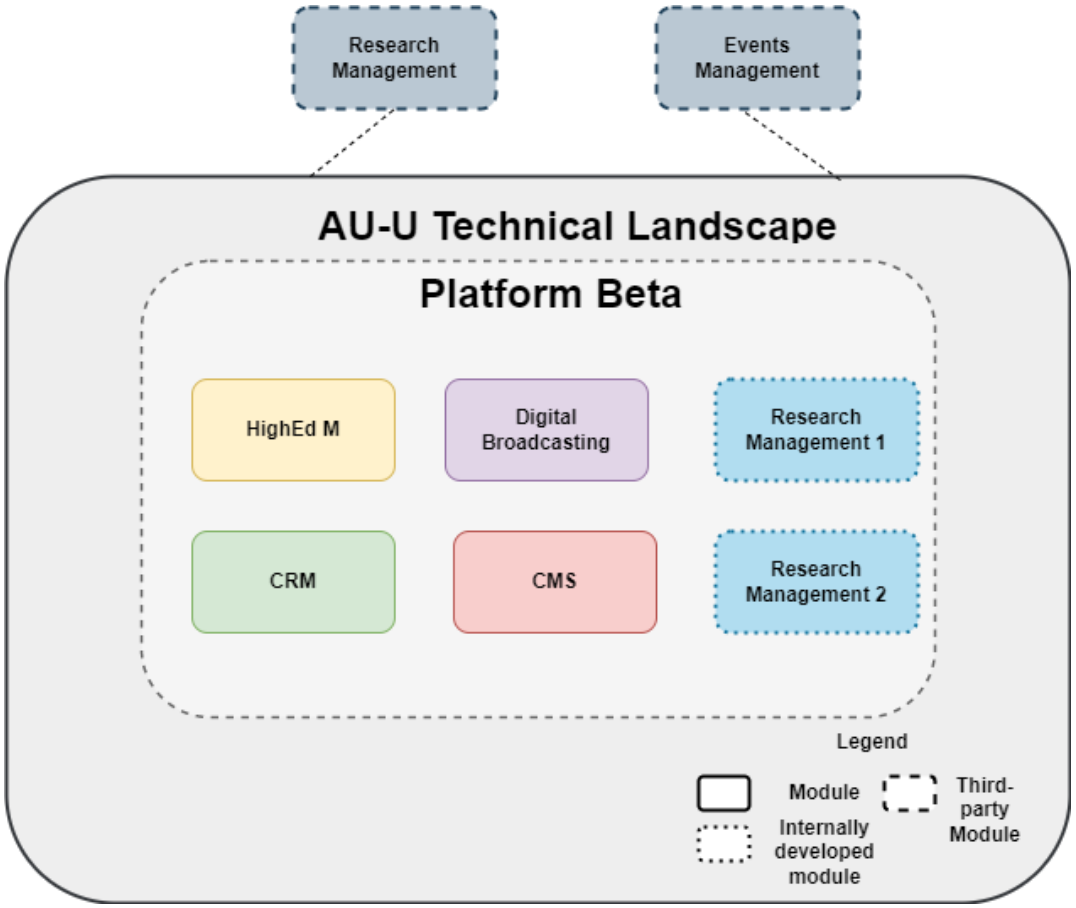

Figure 5 — High-level illustration of the platform Beta

4.7.4 Case Gamma

Platform Gamma is a digital platform offering micro-credential courses, other shorter forms of learning and fully digital courses for the postgraduate market. Its offerings can be purchased online through a portal. The digital platform also allows AU-U to continually introduce new value propositions and pursue new markets, with different lines of products to its traditional business. The micro-credential courses were recently extended to the enterprise market, for the purpose of upskilling staff.

The core of the Gamma digital platform is a cloud-based digital experience module with e-commerce functionality including a payment gateway module, content management module and AI-based function for testing, experimentation and innovation. It also links into the learning management module (HighEd M). The e-commerce function of the digital platform is the source of truth for all product related information, including data on pricing for products, drawing information from multiple sources. The digital experience module has the ability to be extended through third-party offerings.

The new digital platform was able to support the whole university, including different product types and varying levels of integration with other systems. The flexibility of the platform allows products to be extended and personalised with ease, supporting ease of innovation in the future. It also includes a customer-centric front-end, connecting all back-end modules into a streamlined user experience. There is also an AI-driven module for skills-matching to help organisations upskill their workforce using AU-U's micro-credentials and short courses.

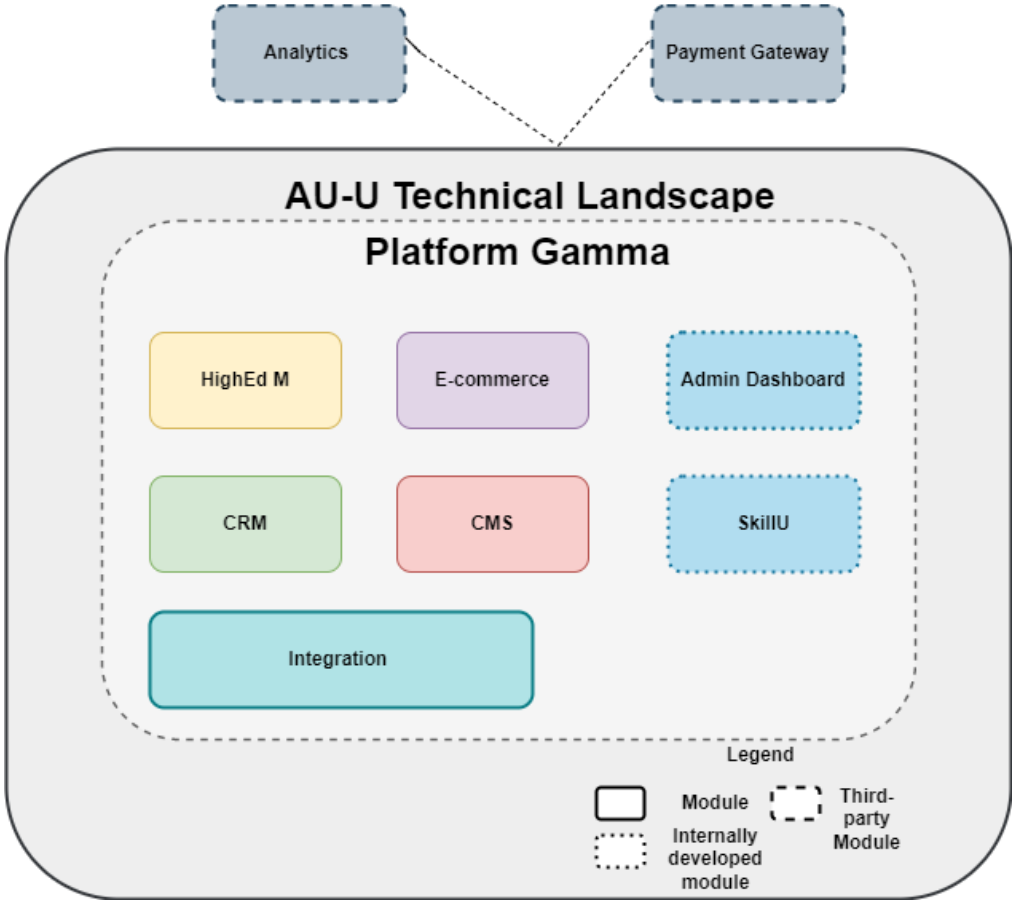

Figure 6 — Illustration of platform Gamma

4.8 Data Collection

Data was collected between May 2020 and October 2021 through semi-structured interviews, as the primary technique for data collection. A total of 31 interviews was conducted across the three cases (13 interviews for case Alpha, 12 interviews for case Beta and 6 interviews for case Gamma).

The number of interviews pursued was guided by pragmatic reasons and until theoretical saturation had been reached. Interpretivist research aims for richness of insight and as such the optimal quantity of interviews will vary. As Myers (2013) asserts **"** I am not convinced that there is a such a thing as an ideal number of interviews" (p.167). The majority of the interviews lasted approximately 60 minutes and were audio recorded and transcribed verbatim. All interviews were conducted over Zoom or Teams. Two interviews were conducted over email. This was due to unique circumstances surrounding COVID-19. With these two interviews, I had the opportunity to ask follow-up questions and engage with the participants. This is not the same as conducting questionaries, which are often generic and collected from anonymous

participants. Semi-structured interviews allow for “both retrospective and real-time accounts by those people experiencing the phenomenon of theoretical interest” (Gioia et al. 2012 p. 19).

A variety of different participants were selected based on their knowledge and experience (Myers and Newman 2007). Interview details are captured in Table 18. To avoid elite bias, it is recommended that a variety of different perspectives should be considered to represent a diversity of “voices” and increase the validity of the findings (Eisenhardt and Graebner 2007 ; Myers and Newman 2007). This was achieved by selecting interviewees from different areas and levels of the organisational hierarchy. Participants were selected from both the strategic and the digital platform levels, including staff from the areas of Business and Technology, but also academic staff. A range of different positions ranging in seniority were selected. Care was taken to select individuals with decision-making rights, but also individuals in operational roles such as business analysts and developers, as well as users for a richer data set.

Table 18 — Interview Details

Case	Level	Interviewees	Dates
	Senior Executive	Executive Director	19/8/2020
		Head of Operations	11/10/2020
		Head of School	30/11/2020
	Mid-Level Management	Head of Platforms	20/10/2020
		Support Services Manager	28/7/2020
		Senior Enterprise Architect	6/10/2020
		Technical Manager	4/8/2020
		Platforms Manager	4/9/2020
	Specialist	Senior Business Analyst	15/12/2020
		Analyst/Programmer	1/7/2020
	User	Three members of academic staff	9/7/2020, 16/7/2020, 21/7/2020
Beta	**Senior Executive**	Program manager	14/10/2020
		Product owner 1	21/10/2020
		Product owner 2	27/10/2020
	Mid-Level Management	Senior Project manager	6/5/2020 and 19/10/2020
		Senior Enterprise Architect	18/5/2020
	Specialist	Business Analyst	11/5/2020
		Change Manager	12/5/2020
		UX Designer	13/5/2020
		Technical Lead	26/5/2020
		Human-Centred Design Specialist	23/9/2020
	User	Researcher	28/4/2020
Gamma	**Senior Executive**	Deputy Head of School	8/9/2021
	Mid-Level Management	Communications & Marketing Manager	5/5/2020
		Courses and Marketing Manager	7/5/2020
		Program Coordinator	21/9/2021

		Industry Collaboration Manager	19/10/2021
	Specialist	Strategy Analyst	8/5/2020

31 interviews conducted with 30 unique participants

For platform Alpha, the initial participants were found using LinkedIn, through media articles and also by recommendation. LinkedIn was an effective platform for finding key contacts by doing a keyword search. As I engaged with media articles, and AU-U's website, I was able to identify additional participants. For platform Beta, I was introduced to the Product Owner who provided access to the whole team working on the digital platform. All those who were interested in participating were interviewed. For platform Gamma, I was introduced to the main strategic partner on the program who connected me with the initial set of participants. For Alpha, and Gamma cases, as I conducted the interviews, I asked the participants to recommend others who might be appropriate to interview. This technique is referred to as *snowballing* (Myers and Newman 2007). All participants were formally invited to participate in the study via email.

Contacts provided information on their respective areas, but many were able to comment on other areas and digital platforms as well. For example, an Enterprise Architect could provide information about the technical features and the evolution of digital platforms, but also the overall strategy. While senior level participants could provide a more detailed account of the strategic directions, the lower levels had a deeper understanding of the micro-level organisational aspects. End-user perspectives also provided a more in-depth understanding of the operational aspects regarding the digital platforms.

The participants collectively possessed adequate knowledge of the digital platforms and the strategic and operational actions taken throughout their evolution. It is through these different perspectives that the researcher formulates their interpretation (Walsham 1995a). To ensure rigour, I ground this research in the assumption that the participants are "knowledgeable agents" and that they can "explain their thoughts, intentions, and actions" (Gioia et al. 2012 p.17)

In line with Walsham's (1995a) recommendations, the interviewees were encouraged to express themselves freely, with my role as the researcher being to guide the direction of the conversation. This meant that there was no strict adherence to the order of the questions, but the questions followed the flow of the conversation. The questions were open-ended, giving the participants the opportunity to provide rich responses. Probes when used when necessary for the participants to expand on their responses. Follow-up questions were also asked when new, interesting insights emerged. The open-ended style of interviewing provides a certain level of flexibility and the researcher has the freedom to improvise to elicit additional information (Myers and Newman 2007). The participants were asked to describe the digital platforms, how they emerged and how they coevolved with strategic actions over time. They were also asked to describe, (according to their role) the strategic and the architectural decisions that led to digital platform changes, but also how the platforms shaped the strategic direction of the university, including its impact on its operations. Moreover, they were asked to identify any triggers that led to the coevolution, as well as hindrances that may have dampened coevolutionary effects.

The interview protocol was constantly revised as new information was revealed, recognising "that the interview questions must change with the progression of the research" (Gioia et al. 2012 p.20). This process is referred to as *theoretical sampling*, that is sampling is driven by the data and not established a priori, making the data collection process recursive. As new

concepts emerge from the data, new questions arise which determine what will be collected in the next round of data collection. The questions still remain relevant to the given topic, but evolve as the researcher's understanding evolves. The purpose of this process is to discover new and relevant properties and dimensions about concepts, rather than to test a hypothesis (Corbin and Strauss 2008). This process provided a rich data set, resulting in 257 pages of transcribed data.

Secondary data (see Table 19) was used to build a better understanding of the case organisation, as well as for triangulation purposes. Triangulation is a means of increasing validity by doing two or more techniques for gathering data. Case studies may triangulate data with just one research method – e.g. triangulating interview data with published and unpublished documents (Pan and Tan 2011; Myers 2013).

Table 19 — Secondary data used

Types of Documents	Purpose (Greater understanding and Triangulation)
Strategy and architecture internal documents	Provided more information on the timing of key decisions, as well as strategic actions and the evolution of the digital platform architecture.
News articles	Helped to identify further participants in the organisation and validate some dates. It also provided an additional narrative to validate the interview data.
Vendor articles	Provided more information about the digital platform modules and validate interview data.
University website	Helped to build a greater understanding of AU-U as an institution, its values, as well as its place within the higher education sector in Australia.
Blog run by the Transformation Hub	Provided more details about the digital platform modules and some key events during the evolution of the digital platforms to validate the interview data.

Written evidence is useful for more exact details people have trouble remembering, such as dates. It can also be done by interviewing people at different points in time (Myers 2013). Making use of secondary data helps to improve the reliability of the study (Eisenhardt 1989a). The secondary data included a number of internal documents sourced from the participants, as well information from the university's public website, and media articles. During triangulation information from the interviews was cross-checked with secondary data to strengthen validity and reliability. I also employed the technique of interviewing people at different points in time. For example, for case Beta, an emergent platform, a project manager was interviewed twice at two different points in time. This allowed me to uncover how the

digital platform evolved from point A to point B, the challenges presented, and future directions not yet realised. For case Gamma, the interviews were split strategically into two phases to capture two different points in time. The first phase captured the move to micro-credentials, while the second phase focused on the industry upskilling initiative that was being conducted during data collection.

4.9 Data Analysis

As a prelude to the data analysis, I began by immersing myself in the research context to get a deeper understanding of the case organisation and its DT through platformisation journey. This involved a preliminary step of employing a *narrative strategy* to construct a story from the raw data in order to develop a chronology of the events and delineate the journey into different phases (Langley 1999). This process helped to condense a large volume of data and get a deeper understanding of each individual case, which in turn accelerated cross-case comparison (Eisenhardt 1989a).

For the data analysis, I engaged in different cycles of coding summarised in Table 20 below**.** During this process, I kept my focus on the phenomenon under investigation to understand how each case contributed to the overall DT through platformisation journey. Case data was analysed separately to understand how DT unfolded, followed by a cross-case analysis to identify any common patterns. This process involved a continuous cycle of iteratively moving between the data and the theoretical conceptualisation (Langley 1999).

I engaged in these iterative cycles of coding, following the preliminary step of the analysis, by reading and re-reading the interview transcripts. The coding was done using NVivo software. I started the process with the first cycle of coding (Saldaña 2016), also known as open coding (Corbin and Strauss 2008; Myers 2013). During this time a large number of codes emerged, as I kept as close to the participant data as possible. The purpose was to code any meaningful data about the changes taking place that were in line with the research questions. For example, on platform Beta identification of new platform features or architecture changes were coded as “digital platform changes”. The articulation of the strategic decisions impacting the emergence of platform Beta were coded under “strategy definition”. Sometimes multiple codes were assigned to a single unit of analysis. This process is described as “breaking data apart and delineating concepts to stand for blocks of raw data” (Corbin and Strauss 2008 p.5). This resulted in a number of empirical first-order concepts (Gioia et al. 2012).

Axial coding was performed in tandem with open coding. During this process, I looked for relationships between the codes, grouping them under categories. The different categories made up either social or technical concepts. For example, the category Digital platform architecture included the codes “integration”, “reconfiguration” and “disintegration”. Other examples of higher-order categories included “Strategy”, “Operations”, “Governance” “Digital Platform”, “Triggers”, “Hindrances” and “Enablers”. This was an opportunity to reduce the initially large number of codes. Some codes were merged and others removed, resulting in a more meaningful set of codes, organised into categories. Through this process, I started offering my own interpretations of the empirical data. This coding phase is also synonymous with thematic analysis, described as “a form of pattern recognition within the data” (Fereday and Muir-Cochrane 2006p. 82)**.** By identifying relationships between/among emerging constructs, I ended up with what are known as second-order themes (Gioia et al. 2012). Theory and an intuitive analysis are critical to the formation of good second-order concepts. Examples of popular second-order concepts in IS include ‘automate’ and ‘technological frames’ (Walsham 1995a p.95).

Next, I proceeded to develop the aggregate dimensions by abstracting the "2nd-order themes even further" (Gioia et al. 2012 p.20). In this way, I was able to derive the mechanisms of DT through platformisation. For example, the Multilevel Platform Development mechanism emerged through the codes *micro-level platform adaptation* and *macro-driven platform requirements.* The process of abduction led me to a number of mechanisms of DT through platformisation for each of the cases. In addition to observing the micro-level interactions to derive the mechanisms, I was also able to zoom-out and get a higher-order perspective, in order to formulate the theoretical model. The resulting data structure is described in Appendix C.

Following this process, I then proceeded to interpret the aggregate dimensions through the lens of theory of coevolution. I consulted the coevolution properties and adaptation principles described in Chapter 3. Although a number of outcomes were observed for each case, I refrain from proposing causal relationships between the mechanisms and the outcomes. Coevolutionary relationships are not deterministic and as such cannot be considered as causal. I also recognise that in such dynamic settings outcomes are continually evolving. This process was done using theoretical coding, also referred to as "selective coding" or "conceptual coding" (Saldaña 2016)**.** A theoretical code is described as "an umbrella that covers and accounts for all other codes and categories" (Saldaña 2016 p. 250). During this process all codes and categories become methodically integrated around the core theme of the research, which offers a theoretical explanation for the phenomenon (Corbin and Strauss 2008)**.** The theoretical dimensions emerge through an iteration between the codes and the literature (Myers 2013).

Theory was not used in a rigid way, but to provide guidance in my interpretation of the empirical findings (Klein and Myers 1999).The emerging theorising was not bound by rigid theoretical constructs, but became an ongoing process of refinement (Pan and Tan 2011). The coevolution theory offered a number of concepts that allowed me to explain and theorise the mechanisms that I interpreted from the data. In particular, it allowed me to engage in multiple levels of analysis (strategy, digital platform, as well as the internal and external environment), observing how the exchanges between the coevolving levels led to change. During this process, I also kept an open mind for concepts that did not fit the theoretical lens in order to extend theory. As the literature was consulted throughout the process, the analysis transformed from induction to abduction, as the theory and the data began to fuse (Gioia et al. 2012). Abduction is considered an appropriate method for interpretivism (Lewis-Beck et al. 2004). As, there is no single method or logic for deriving mechanisms (Bunge 2004), it will ultimately depend on the researcher's field and epistemological and ontological stance.

The aim of qualitative research is to generate insights beyond the empirical data itself, often in the form of one or several 'conceptual leaps', which are rooted in abductive logic (Klag and Langley 2012). A conceptual leap is defined as "a consciously realised and abstract theoretical idea in an empirical study that may or may not make its way to a theoretical contribution in its final form". Achieving a conceptual leap requires the researcher to form a link between empirical data and theory to discover new concepts, relationships and explanations (Klag and Langley 2012 pp. 149-150).

Once the mechanisms were derived for each case study, they were further organised into tentative descriptive categories to assign a higher-order meaning to them, based on the literature. These categories were continually challenged and altered, as new categories emerged. A cross-case analysis of the mechanisms was then performed. Where the same or similar mechanism was identified between the cases, this led to a merging into a single mechanism. The tentative descriptor categories were further refined and mechanisms

regrouped into new descriptive categories, informed by the literature on both DT and digital platforms. Adding this step led to a more comprehensive analysis "beyond the initial impressions" (Eisenhardt 1989a p.533)**.** This step also guided me against premature conclusions, further improving the study's validity. This allowed me to extend the initial micro-level mechanisms into a higher-order framework of mechanisms of DT through platformisation (described in more detail later). In this step, I developed the following mechanism groupings for the mechanisms; Strategising, Digital Organising Logic, Innovation, Digital Platform Design, Digital Platform Development, Digital Platform Architecture, Improvisation and Experimentation mechanism categories. These categories were further aggregated into higher-level categories to form a theoretical framework. These categories were Mechanisms in Stable Contexts and Mechanisms in Extreme Contexts. Mechanisms in Stable Contexts included Strategy-Oriented mechanisms and Digital Platform-Oriented mechanisms. Mechanisms in Extreme Contexts included Hybrid mechanisms. The data analysis steps are summarised in Table 20 below.

Table 20 — Summary of Data Analysis Steps

Step	Method	Purpose	Outcome	Coding examples
1	Open coding	Identifying the initial set of codes for each case	A list of first-order concepts keeping close to the data	"digital platform changes" and "strategy definition"
2	Axial coding	Identifying themes and relationships for each case	Deriving higher order concepts under the groupings of Strategy, Operations, Governance, Digital Platform, Architecture, Triggers, Enabler and Hindrances	The Architecture category encompassing "integration", "reconfiguration" and "decomposition"
3	Aggregate Dimensions	Abstracting second-order themes further	Mechanisms of DT through Platformisation	Multilevel Platform Design mechanism includes "micro level platform adaptation" and "macro driven platform requirements"
4	Theoretical coding	Interpreting the mechanisms through the lens of theory	Integrating categories from the previous step around the	Abstraction mechanism includes the theoretical code of "Modularity"

			core research theme	
5	Cross-case analysis	Comparing mechanisms for each case and merging some mechanisms	Grouping mechanisms into higher-order groups to form a theoretical framework	Strategising, Digital Organising Logic, Digital Platform Design, Digital Platform Development, Digital Platform Architecture, Innovation, Improvisation and Experimentation mechanisms. These were organised into Mechanisms in Stable Contexts (Strategy-Oriented and Digital Platform-Oriented) and Mechanisms in Extreme Contexts (Hybrid mechanisms).

When I ceased to uncover new insights from the data, I contended that theoretical saturation had been reached, as advised by Pan and Tan (2011). This is not a particular measure, but the researcher's own discernment that the theory is developed enough to provide explanations for the empirical evidence. At this point the researcher is advised to accept any gaps as limitations of the research, to avoid getting stuck in an infinite loop of research (Corbin and Strauss 2008). Original theory development, fulfilled through grounded theory is not always a requirement of qualitative research. Utilising pre-existing theories in different contexts, elaborating and challenging them is just as valuable (Saldaña 2016). Table 21 below contains the evidence of how I adhered to the key principles for conducting interpretive research in this study, as recommended by Klein and Myers (1999).

Table 21 — Principles for Evaluating Interpretive Research (Klein and Myers 1999)

Principle	Evaluation Criteria	Application of Principle
Fundamental Principle of the Hermeneutic Circle	"Requires that all human understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form."	Engaging in a multilevel analysis allowed me to make connections between the different levels of the analysis (strategic and digital platform levels, as well as environmental factors). Diversity of participants were selected from different areas of the organisation, as well as different levels of the

		hierarchy to represent a variety of voices. Circulating between the different perspectives allowed me to form a higher-level perspective of how DT through platformisation transpired.
Principle of Contextualisation	"Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerged."	Care was taken to get an understanding of AU-U as an institution, its values, as well as its place within the higher education sector in Australia. Some participants had been with the organisation for over 20 years and were able to articulate the conditions and processes that led to the emergence of the DT through platformisation. This included the evolution of the legacy systems and their limitations, as well as changing work practices.
Principle of Interaction between Researchers and Subjects	"Requires critical reflection on how the research materials (or 'data') were socially constructed through the interaction between the researchers and participants."	Mutual understanding between the researcher and the participants was reinforced by active listening and asking of follow-up questions, as well as reiterating statements to validate my own understanding by the participant. As the interview process unfolded, the information was used to formulate new questions and also to ask follow up questions from future participants. Information was validated from participant to participant, as I started to recognise patterns in the empirical data.

		Also throughout the process new participants were recommended and interviewed, which gave me the chance to elaborate on concepts. This process reinforced the overall validity of the findings.
Principle of Abstraction and Generalisation	"Requires relating the idiographic details revealed by the data interpretation through the application of Principles 1 and 2 to theoretical, general concepts that describe the nature of human understanding and social action".	Concepts from the coevolution theory were used to organise and interpret the insights that were emerging from the data. However, this was not done rigidly, but rather in loose adherence to theoretical concepts. This allowed me to recognise concepts that did not fit the theoretical lens.
Principle of Dialogical Reasoning	"Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings ('the story which the data tells') with subsequent cycles of revision."	I originally started this research by focusing on internal digital platforms in the organisational context. This was largely informed by digital platform literature. Engaging with the empirical findings allowed me to challenge this preconception and recognise a higher-order phenomenon of DT through platformisation. In turn, I consulted another body of literature — on DT.
Principle of Multiple Interpretations	"Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study; similar to multiple witness accounts even if all tell it as they saw it."	Where contention was observed between different participants' responses, they were reconciled by my own sense-making processes to merge the different perspectives into a higher order story.
Principle of Suspicion	"Requires sensitivity to possible 'biases' and systematic 'distortions' in	Secondary data in the form of publically available information, internal

	the narratives collected from the participants.”	documents, blogs and emails were sourced for triangulation purposes in order to avoid possible bias. Also vendor articles, news articles were sourced to eliminate possible distortions of the facts, or possible false interpretations.

In this chapter, I provided an overview of the Methodology employed, including the research context, and information on data collection and analysis. I also provided a justification as to why this particular methodology was the most suitable. I now go on to present the research findings from the three cases explored.

Chapter 5: Research Findings

This chapter presents the findings from three cases contributing to DT through platformisation at AU-U. Each case is an example of a different type of a digital platform corollary to cumulative organisational improvements over time. Firstly, I discuss the initial challenges and triggers, followed by the antecedent conditions for DT through platformisation at AU-U, before I move on to the individual cases.

5.1 Pre-DT Challenges and Triggers for AU-U

Like many universities today, AU-U is beleaguered with the dual responsibility of balancing enterprise and institutional goals, a challenge far greater than most other types of pre-digital organisations are confronted with. At the same time, AU-U is still facing some of the common challenges of many traditional organisations today, which are encumbered by outdated and inefficient technology landscapes and work practices. AU's technical landscape evolved into a complex web of systems and supporting business processes. Some of these challenges motivated AU-U to automate and streamline its processes, update its technologies and improve the way of working. In this research, I focused on three organisational domains at AU-U. Teaching, learning and administrative units are considered as a single domain for brevity. Also, postgraduate education and industry collaborations, although different units are also considered here as a single domain. The third one is Research.

The teaching and learning domain, along with the business and administrative functions of the university evolved into a complex technical landscape over the years as is the case with other areas of the university. Some of its legacy systems are approximately 20 years old, based on bespoke functionality and often redundancy. As a traditional university AU-U's primary model relied on face-face teaching with technology playing more of an axillary rather than a central role.

A third-party legacy learning management system introduced in the 2000s evolved organically over a period of 20 years without any formal governance, which resulted in a complex, inefficient and ineffective system. This is exemplified by the quote:

> *"So, I think that [AU-U] in its move into the kind of online digital learning space, it evolved in a fairly organic way, as it did in so many institutions where enthusiasts, tended to lead and be champions. Some people, you know got involved up to their comfort level and others stayed away." — Executive Director.*

The legacy learning system was a tightly coupled system, with a lot of functionality that was not necessarily used. Any modifications to the system came at a cost, as well as increased complexity. It played more of an auxiliary role, not for teaching and learning, but more for file sharing. It was not considered an interactive technology. Its main role was to support the face-to-face learning aspects. Hence, the legacy learning system was not a core component of the overall teaching and learning strategy. The lax governance led to a number of problems including a lack of standardisation, as well as a lack of usability.

Executive Director comments:

> *"So there was huge amount of autonomy in what faculties did and what individuals did. So if individuals had a preference for a particular technology, they usually just went and got it, or asked for it. So we had a not very streamlined set of tools and applications orbiting around [legacy system] with real issues. So support issues. So how can our staff be properly*

supported if there's a proliferation of tools? It meant that we had a situation, where the students, they might have up to 6 different tools to perform the same learning activity, depending on the subject they were in and the faculty they were in.“

Its lack of usability was reflected by:

“A user interface that was not intuitive, requiring several clicks through menus to find things [and] lack of adequate documentation – for example, for a long time no one seemed to know what access privileges were allocated to users of different labels – student, guest, TA etc.” — Member of Academic Staff (User).

AU-U needed a considerable overhaul of its technology to meet the increasing challenges of the digital era. In the words of the Executive Director on the Transformation Program:

“So essentially we couldn't become the university that we needed to become, wanted to become unless we replaced a whole lot of legacy systems and allowed for the development of an ecosystem where there was seamless communication between the systems”.

These sentiments were echoed in the academic community, which struggled with the limitations and usability issues present in the legacy system. In the words of a Head of School:

“[Platform Alpha] has developed in response to academics' want to be able to place in and make available for these subjects, but also in response to student feedback. So there have been some aspects to it that have been driven from our [centralised learning improvement department]. But I think there's also been the push from academics to make it more usable […] some of the limits are its usability.”

The Research domain was facing similar challenges. Organisational silos limited collaboration and knowledge-sharing. The systems landscape was complicated and inefficient.

“We've also been assessing the state of our research systems at [AU-U] because they had grown pretty organically and there was a real lack of understanding a year and a half ago. Exactly what systems we had, how they integrated, where the pain points were and where we might invest in the future. So we made a lot of progress on that in the last year. And we're in a position now where we're putting together the roadmap for the research domain as well.” — Senior Enterprise Architect.

The Research domain was also plagued with inefficient processes and the inability to access relevant information that can help academics in their research, as well as their overall careers.

“The biggest business problem we had was people can't find anything, they can't find access to their resources or things that would help them. Sometimes, it depends on what stage of their career they're at, whether they're early, mid or late career researchers. Even then the late career researchers really don't understand a lot, but maybe not everything that would help them be successful as a researcher.” — Senior Project Manager

In the postgraduate domain, a decline in domestic enrolments brought up challenges of a different kind. Market research was conducted leading to a revamp of AU-U's postgraduate strategy.

> *"The overall postgraduate strategy was launched because we were looking at falling domestic enrolments for post graduate education. This was to look at doing something different with postgraduate education really kind of reimagining what that could be. A lot of that data was telling us that people were looking for increased flexibility. Postgraduate offerings is a very crowded market, looking at learning in smaller chunks. Students were looking for greater flexibility with their courses […]. There's still a huge value for master's degrees, more traditional types of learning. The research was telling us the market was looking for a far more flexible offering, which was really the rationale for looking at how we could enable that, enable a more digitally enhanced learning" — Strategy Analyst.*

Prior to that, as a traditional university, AU-U remained focused on face-to-face teaching, with digital technologies playing more of an auxiliary role. This change caused AU-U to move more towards a hybrid model. These changing student expectations propelled the university to pursue new value propositions in the form of short courses and micro-credentials that could be completed individually or contribute towards a degree. As a Technical Manager notes:

> *"The rate and change of the workforce has meant that the Baby Boomers have had to come back now to upskill […] and the way they're trying to do that is trough micro-credentialing, sort of short courses."*

In addition to the postgraduate market, an opportunity presented itself for industry collaborations with large organisations looking to upskill their staff. The onset of COVID-19 impacted AU-U in two notable ways. Firstly, it placed strong demands for a new way of operating and delivering education, due to the government social distancing directives. Secondly, seeing reductions in revenue from the international student market, due to travel restrictions, AU-U has had to consider new value propositions and partnerships with the industry to remain viable. The industry partnerships and the upskilling program became a high priority, as a new income stream. In the words of a Senior Enterprise Architect:

> *"[Industry partnerships and upskilling program] is a massive priority for [AU-U] because traditional revenue streams have dried up because of COVID, so obviously less international students".*

5.2 Antecedent Conditions for DT through Platformisation at AU-U

AU-U started to introduce cloud technologies in 2012 to optimise its infrastructure and allow access to capabilities that were hard to acquire on-premises. In 2016, the university's IT department adopted a cloud strategy in order to shift to a flexible infrastructure capable of supporting its growing enrolments and new industry partnerships. The strategy was to streamline the infrastructure and incrementally move to cloud Software as a Service (SaaS) platforms. By 2017, AU-U was starting to invest in SaaS collaboration and productivity platforms. AU-U also made investments into cloud infrastructure, which allows for an ease of implementation of new digital platforms via APIs.

> *"I think a lot of the environment management capabilities have been improved over the last couple of years, so we can manage costs, we can quickly spin up new environments and bring them down when they're not needed" — Senior Enterprise Architect.*

The trend was reflected amongst all AU-U domains including Research. AU-U's research strategy was focused on building greater visibility of its research globally by moving some of its core research systems into the cloud and allowing international researchers to collaborate with AU-U.

> *"There's been big investment into our research data platforms. There's a key system there [ModuleR], we developed in house, but I guess that's been a big investment there and good progress there in the last couple of years" — Senior Enterprise Architect*

In 2018, AU-U identified a need for a new organisational strategy to support its long-term vision. A crowdsourcing initiative was launched through an idea management platform (IDM) as input to its long-term strategy, involving partners, staff and students.

> *"So two years ago, they did the crowdsourcing initiative and essentially came up with [AU-U organisational strategy]"— Platforms Manager.*

A long-term strategy emerged consisting of the guiding pillars, however recognising the need for flexibility in a dynamic environment. The vision addressed a need to adapt to fast-paced changes in the broader higher education sector, as well as the changing nature of work in Australia and abroad. It also envisioned to improve AU-U research function, strengthen its brand and identity and forge meaningful partnerships. Each guiding pillar was supported by a number of initiatives to be delivered in shorter intervals. Digital platforms were at the nucleus of this transformation with a number of sub-strategies emerging within the university, all aligning with the broader vision.

Prior to 2014, each organisational unit had its own IT department. AU-U recognised a number of issues with this model, such as a lack of standardisation, as well as security flaws. In 2014, these IT functions were merged into a single IT department that would provide shared services across the university. However, the department's set up was still not congruent with the university's broader organisation strategy. Changes needed to be made to the way the department was structured for AU-U to achieve its longer-term vision.

This led to the emergence of a digital strategy. In alignment with the organisational strategy, this strategy included hybrid forms of learning, personalisation and a reconceptualisation of AU-U educational offerings to an ongoing mode of delivery beyond a student's completed undergraduate degree.

> *"We haven't had a formal digital working strategy before. We've had [IT] strategies, but we haven't gone down to that next level of having domain strategies" — Senior Enterprise Architect*

This also gave rise to a new governance model. Each domain is responsible for its own governance. The governance committee is made up of senior business stakeholders and IT partners, in a departure from the university's traditional governance processes, which were heavily controlled by the central IT department. The IT partner in liaison with the business partner from the domain works on the priorities for that domain and then reports the outcome to the centralised architecture function that then governs the future path. Above each domain is a centralised committee of senior executives to ensure a strategic fit to the broader organisational strategy. As part of this process, the IT department was also to be restructured around the domain model. Each domain would have an IT function with a strategic and operational capacity.

> *"A part of that digital strategy is what we call a [governance model] – how does the university govern our digital journey? The way that we've proposed that and I think it's been broadly accepted is that each domain has a [governance board]. So there's a senior business stakeholder, rather than an IT person. The IT person partners with that business stakeholder to figure out what the plans are for each domain and then we meet every quarter to review progress, replan for future and govern that path forward. That didn't exist before" — Senior Enterprise Architect.*

Engaging with an external consultant, AU-U conducted interviews with the key stakeholders across the university to find out what their priorities were. The strategy was co-designed with the key business stakeholders, as well as the IT department. The information was collated by an external consultancy, which presented the key recommendations including a proposal for a new governance model, a platformisation model and changes to the IT operating model.

> *"We went out and we did I think 70 interviews across the whole of [the university] asking what people saw as the key strategic drivers of change for the university, how digital might help us achieve a digital vision for the university and what the priorities were in each of their areas and we co-designed the digital strategy with business stakeholders and also a lot of the people within [IT department] as well" — Senior Enterprise Architect*

This strategy focused on building digital capabilities for each domain. The strategy was designed to be adaptive to an evolving higher education market. In a fundamental shift to the university's organisational structure, the IT department partnered with stakeholders across the university to plan and prioritise digital initiatives for each domain. This was a true departure from the traditional function of the IT department, structured around technical expertise, to an agile, integrated business and IT function. The university sees itself as being in a transformation state at present.

To realise its vision, architectural changes, both business and technical were required to improve the experience of both staff and students. By 2020, what followed was an organisation-wide DT through platformisation strategy dividing the organisation into main domains according to its business model and allocating the digital platforms that would support these domains, including domains shared across the university. The university procured a cloud-based integration platform to facilitate better integration between the digital platforms and simplify its technical landscape.

> *"It basically facilitates the integration of systems, the movement of data between applications between, you know, near real-time frames as opposed to custom build system integration which can be a lot slower and can also be less stable then a cloud-based integration platform, so that was implemented a couple years back, and we're continuing with our journey with that" — Senior Enterprise Architect.*

In the shared services domain, AU-U's strategic priority is to replace some of its legacy HR and financial management systems, which are run on the premises. The goal is for these systems to be replaced with cloud-based platforms when a suitable option becomes available on the market. Another priority for AU-U is its big data and analytics. Data resides in different digital platforms across the domains, which are abstracted into data warehouses with analytics platforms running on top of them. The big priority for AU-U is enabling different departments to better share data and collaborate.

Already plagued with an exorbitant amount of complexity, the onset of the COVID-19 pandemic introduced challenges of unprecedented measure. Political, social and economic factors threatened the very existence of the organisation. Compelled to keep its operations running amidst the chaos, AU-U went through a series of adaptations, which are described next.

5.2.1 Emergence of Extreme Contexts

At the beginning of 2020, the effects of the global Coronavirus pandemic have started to unfold in Australia. I use the term 'extreme contexts' to refer to the uncertain and unprecedented nature of the events resulting from the pandemic and to distinguish these events from more stable contexts (i.e. normal times). To counter the spread of COVID-19 the Australian government introduced a number of social distancing measures leading to closures of businesses and institutions. The higher education sector responded swiftly to the newly enforced rules and began planning shifts to online modes of operation. The timeline for these extreme contexts for AU-U unfolded as follows:

Table 22 — Timeline of Extreme Contexts

Early March 2020	With cases of COVID-19 emerging abroad, different travel restrictions were put in place in Australia. This affected AU-U's internal students unable to enter the country.
March 17 – March 24 2020	By March, the pandemic had spread to Australia, forcing AU-U to make further adaptations to adhere to the health advice. This involved campus closures.
March 24 2020 - Mid April	AU-U was forced to shift to alternative modes of operation. Acquisitions of digital platforms prior to COVID-19 set serendipitous conditions for the change.
End of April 2020 - June 2020	Conducting exams, as one of AU-U's core, centralised processes became a major challenge at this time. Due to the inability to meet the social distancing requirements, it was evident the exams could not be conducted physically, and alternative methods needed to be sought.
July 2020 to Present	Faced with a financial loss due to the falling international student market, AU-U needed alternative revenue streams and business models to keep resilient amidst the uncertainty.

I now present the evidence of DT through platformisation at AU-U through three case studies of digital platforms. Each platform represents a different type of an internal digital platform: a productivity platform, a collaboration platform and an innovation platform. The emergence and

evolution of the digital platforms transpired through coevolutionary dynamics between the strategic level and the digital platform level in relation to the environmental factors influencing them.

5.3 Case Alpha — Productivity Platform

Three distinct periods were observed for case Alpha, during its DT through platformisation journey, summarised in Table 23 below. The changes resulted from coevolutionary effects between the strategic and the digital platform levels.

Table 23 — Case Alpha phases

Period	Years	Description
Shift to digital platforms	**2016-2018**	Following the cloud strategy, AU-U started adopting new SaaS modules, resulting in the emergence of platform Alpha.
Transition	**2019-2020**	Programs initiated, focusing on transforming teaching, learning and ways of operating.
Accelerated DT in Extreme Contexts	**2020-2022**	The onset of extreme contexts brought on by the Coronavirus pandemic accelerated DT through platformisation.

5.3.1 Shift to Digital Platforms

Following the implementation of the cloud strategy in 2016, in 2017 AU-U started acquiring more third-party SaaS digital platforms (referred to here as modules, not to be confused with the digital platform as a whole). Beyond the academic context, the focus on adopting these new modules inspired new ways of working, which continued as an ongoing trend.

During this time a video conferencing module — ChatU (pseudonym) and a third-party productivity and collaboration suit of modules, referred to here as CollabU were acquired. On the digital platform level, a new initiative commenced to drive the awareness and adoption of these modules across the university.

> *"I played a role there sort of around adoption. So I went around the university to make sure that people were aware we had [CollabU] and encourage people to use it" – Platforms Manager.*

During the initiative, aimed at driving adoption of CollabU amongst different departments, a common requirement that came up was the need to collaborate with external parties.

In the words of the Platforms Manager:

> *"And the very first question I got every single time I've presented was; can we collaborate with externals? And so it was pretty obvious to me that that's*

the demand. And it had been around for five years or more that people have been asking for it, and the answer was always no. ”

At the time, this was not possible due to security and privacy concerns. In the words of the Platforms Manager:

> *“The whole [AU-U] strategy is around partnership engagement and working with businesses. […]. Our whole strategy is based on working with other people. So we have not until this point really been able to [provide] that in a safe way”.*

With the pressure exerted from bottom-up, this eventually led to the enablement of this functionality at the strategic level.

5.3.2 Transition

The transition period marked a shift in the whole higher education industry with a move towards hybrid forms of teaching and learning. It was recognised that the learning management system plays a bigger role in the actual delivery of education, including interaction. The Executive Director describes the current state of platform Alpha as:

> *“I would describe it as being in transition from what it was to what we’re imagining it will be. I guess most transitions are. I think we’re going away from what I would describe as fairly ramshackle set of arrangements that grew organically to something that we’re now hoping is much more planned and properly integrated. That’s the vision.”*

Continuing with the trend of acquiring SaaS modules and replacing legacy systems as part of its postgraduate revamp strategic efforts, in 2016, AU-U also procured and implemented a new digital learning management module — High-Ed M (pseudonym) to be used in limited capacity for a revamp of its postgraduate offerings, which became one of the components in platforms Beta and Gamma. High-Ed M had the ability to be easily extended through third-party modules through APIs. High-Ed M is based on a modular design and open standards, allowing it to continually evolve, via third-party modules with customised functionality. Seeing the value of High-Ed M in a pilot capacity and looking to evade the cost of running two systems in parallel, this emerging new module influenced a decision to move all AU-U offerings onto High-Ed M. The decision was also motivated by an imminent license expiration of the legacy learning management system and the high cost associated with its renewal and upgrade to a more recent version of that system. By 2018, the university launched a multi-year DT program to transition all its offerings to High-Ed M and decommission its legacy learning system.

At the digital platform level a new cross-functional team was set up — TransformationHub (pseudonym) to lead the DT efforts. The role of the TransformationHub is quite unique in that it has both a strategic and an operational focus. One of its functions was to offer academic support and advice on designing the teaching components, including a drop-in service, organising events, providing training, workshopping and upskilling. Another function was a strategic liaison with the faculties. Its focus is also on how Platform Alpha is used across the teaching and learning domain. TransformationHub also works closely with the IT department, working with various stakeholders to procure new modules for the digital platform. An ad-hoc governance structure emerged during the process.

> *“At the moment there’s kind of an interim governance board, it’s hard to describe it because the [DT] program board is responsible for kind of endorsing the direction of […] the technology ecosystem. So we do regular*

updates to them about what's happening and get their advice on particular issues" – Head of Operations.

TransformationHub is currently in the process of setting up a governance model to guide the evolution of Platform Alpha. In the words of the Technical Manager:

> *"I'm trying to put that governance body together […]. What we [..] procure, implement is going to have to be driven by the governing body and we're just in the process of putting that together at the moment in terms of the terms of use, the roles and responsibilities of key individuals or key [aspects] in the decision-making processes".*

The new governance model is expected to give TransformationHub greater autonomy over the decisions regarding the architecture of platform Alpha. As the Technical Manager comments, it gives TransformationHub:

> *"A little more decision-making authority on behalf of the business, so it becomes a true collaboration between the business and [IT department]"*

TransformationHub works in close liaison with DT Support Services (pseudonym), inspired by the Apple Genius Bar, it has a modern physical space for consultations and collaboration, as well as its own digital platform.

> *"We've got a real kind of capacity building focus within the [DT Support Services], so helping people to learn the systems rather than doing the systems for them. […].Our team mainly looks at the supportive of learning, learning, teaching technologies and how they are kind of used across the university. A few best practice and support for what they're doing and but it also encompasses things like subject site design, so within the learning management system. How to provide that kind of blended learning experience" – Support Services Manager.*

The role of DT Support Services has grown into a unique function between the digital platform and the strategic level of the organisation. In the words of the Support Services Manager:

> *"[It] involves looking at a one level, support and learning design at the university through our central services, so things like drop-in support, and also comes to some strategic liaison with faculties".*

DT Support Services offer staff training and guidance required to embrace the new platform Alpha and its various components. Apart from drop-in support, the team offered a chat concierge module on its support digital platform, where users could engage with the support staff for help and guidance. The platform contains a blog with regularly posted tips and best practices for teaching and learning, and using the emerging Platform Alpha modules. In addition to these services, the team ran regular informative events to keep staff informed of changes taking place and offered additional advice. Academic requests for support and advice for designing subjects could be put through to the DT Support Services by using a service catalogue in the workflow-management module. The department also ran regular events that could be booked through a third-party cloud-based events management module.

> *"We run a number of services for [AU-U] academic staff through that. So learning technologies support, professional development workshops. We have an online [DT Support Services platform] which is a resource for staff and a blog. So we sort of do technology enhanced learning, but with a very*

strong element of staff engagement and organisational development as well" — Head of Operations

A member of the academic staff (user) describes the unique challenges of DT Support Services in balancing standardisation and flexibility across the university:

> *"Those kinds of professionals are there to kind of mediate the institutional desire for uniformity, and the contextual needs of an academic, what flexibility we need with that. So it's kind of, negotiation and exploration."*

As the core, High-Ed M offered only basic functionality. The full-functioning module had to be extended via other third-party modules. The TransformationHub worked with the faculties to perform a gap analysis between the legacy system and HighEd M to decide what new technologies needed to be integrated into the new module, as well as standalone legacy applications. This strategic gap analysis was done in consultation and collaboration with the faculties and other departments to carefully select the future modules for the digital platform, based on future value propositions.

In the words of a Technical manager:

> *"…We're just gathering data as part of what we do and then we're able to analyse that and say this is a pain point for our academic users and if we use that pain-point when we're going out to tender […]. We're not just looking at what would have been conditional requirements gathering techniques or stories, we're not just marking against that, we're marking against pain-points […] and value-add propositions as well".*

Faculties were also consulted as part of the process of procuring new modules into Platform Alpha. Some faculties were using outdated technologies, integrated into the legacy learning system, or individual licenses with vendors for software considered quite outdated. The strategy was focused on avoiding shifting those technologies to High-Ed M, but to ensure what was brought into the new digital platform did not just meet the needs of the users but was able to evolve through proper API standards.

The Support Services Manager described the process as:

> *"We went to all of the faculties and spoke to people who were already using things like [various technologies] which are fairly outdated technology and don't sit well within [High-Ed M] and looked at what that basic kind of rule, trying to focus on the future of it as well, not just replacing what we had, but how to address new needs as we move forward. We went out to tender and had some tender responses through the procurement process, and then have engaged [vendor]. So then after that process, the [TransformationHub] have really taken that, kind of looking at where the needs are and how we can support the uptake of that and what kind of training and resources are needed to be able to get that to be taken up more broadly, and integrated into our BA view."*

The transition marked more than a move from a legacy system to a digital platform, but an opportunity to optimise the whole technical landscape by removing duplication.

> *"That's given us a good opportunity to kind of review the ecosystem and see what tools they're supporting, as well as what tools are needed within faculties, so that we can kind of draw a line in the ecosystem, so we don't*

have double up, you know different tools that people are using" — Support Services Manager.

There was a large emphasis on ensuring the digital platform can evolve in the future.

> *"As part of that, we're also streamlining and making sure that the suite of technologies that we have is fit for purpose and we've got the best tools to do the job for staff and students, in line with the direction of the university and the types of learning that we want to encourage at [AU-U]" — Head of Operations*

Support Services Manager adds:

> *"It's taking a much more kind of human-centered design approach, looking at where some of the gaps, […] the problems […] are, trying to fix them, rather than just trying to replace the systems that we already have. So we're trying to look at what the future of learning and teaching might be as well as trying to replace what we have been doing."*

Following a gap analysis, in the same year, a need for a digital portfolio solution was identified to extend the functionality of HighEd M. This function in the legacy learning system was deemed superior to the one in HighEd M and hence a new solution was sought, as a new third-party module.

> *"We are at the moment tendering for a portfolio solution […] as a result of moving from [legacy learning system] to [High-Ed M]. [High-Ed M]' portfolio tool doesn't really cut the cheese, whereas the [legacy learning system] one does. There are a large amount of schools that use the portfolio solution. We basically have to find a solution to get that content out of [High-Ed M] and into something else." — Technical Manager*

After finding an adequate third-party solution, AU-U commenced the rollout of the new module in 2021. The digital portfolio module included social networking functionality and allowed students to display their achievements, skills, experience and samples of work, and also to share them with peers, educators and prospective employers. Recognising that existing social media platforms like Facebook, Twitter and Linkedin were not the best mediums to display a student's skills, the digital portfolio module was considered to address that gap.

The move from the legacy learning management system to High-Ed M was a necessary step in achieving greater consistency between course subjects and improve the student experience. It was also the opportunity to integrate and extend existing university offerings. Rather than replicating the offerings onto the new digital platform, AU-U took the opportunity to redesign and improve its current offerings.

> *"So, instead of just moving all of the content across, kind of the university saw it as an opportunity to really improve the online offerings that we have at the university and the blended learning and digital kind of environment that we have." — Support Services Manager.*

This often involved challenging preconceived notions of how education should be executed, in light of the possibilities that High-Ed M offered.

> *"In terms of the ecosystem, the support of the learning designers assigned to the project, along with those who ran tutorials about [High-Ed M] through the [DT Support Services], was crucial" […]. As platforms become easier to*

use, the learning designer role changes from enabling the "doing" and the use of the platforms, towards advising and even questioning teachers in the way that they use the platforms to enable learning. A list of content is no longer sufficient preparation. One needs to think of how students will interact with that content and how they will produce evidence that they can use that content to solve problems and to demonstrate a shift in their own consciousness" — Member of the academic staff (user)

The students had also been consulted in the process via focus groups to get their perspective on the design of the new digital platform. This led to a leveraging of the High-Ed M interactive modules like collaborative spaces, live interviews and reorganising the subjects to make them more interactive. High-Ed M included new complimentary features such as 24/7 technical support and a mobile app. Other improvements included a more intuitive calendar that collects and displays assignments and tasks, provides mobile notifications for due dates and new items. The academics could also access additional insights on engagement and student usage, which led to drastic improvements in the user experience.

In many instances, the faculties needed to redesign the courses to make them appropriate for the new digital platform.

"The focus changed completely from a [legacy learning management system] presence that was a static storage of lecture slides and some quizzes, to a new interactive [module]. […]. In contrast, the new [HighEd M] has videos, "drag and drop" interactives and new short quizzes focussed on learning key concepts, places for students to submit their thoughts and comments for scrutiny by other students and by tutors. The overall shift in terms of how the [learning management platform] was used, can I think be described as a shift from providing content to facilitating, enhancing, and demonstrating learning." — Member of the academic staff (user)

During the shift to the High-Ed M unforeseen obstacles came up, where deviations from the original plan were necessary. When it came to undergraduate offerings, the same solution would not hold as previously envisaged for postgraduate courses.

"Not everything is the right solution for groups of that size" — Analyst/Programmer.

In these situations, the module would need to be:

"Re-developed or scaled up a bit more" — Analyst/Programmer.

Alternatively, if those solutions failed a secondary module would need to be considered. The faculties had some flexibility in choosing their DT trajectory.

"So we kind of had to step back and think well the course led approach that you're advocating for how to do this doesn't work for our faculty. Then it went back up, came back down. And now we're finding that we have a lot of opportunity to feed back up. So they've been quiet receptive. We're caring out feedback sessions with staff. So while I think initially, like any strategy, top-down. I think there has been opportunities to feed back and adapt" — Member of the academic staff (user)

As academics started using HighEd M, it started to evolve in an unplanned way. New complementary modules were being requested that were not initially foreseen and offered new functionality not previously available in the legacy system.

According to a member of the academic staff (user):

> *"I think it's really interesting, because it's not really a feature that was missing when you compared it to [legacy system]. It was like the move actually triggered the desire to do more than what the platform offered. So it was, are we going to add this? It's not something we were able to do with [legacy system] and we suddenly missed. It was a process triggered, you know greater needs".*

Similarly, in 2019, the middle management recognised the need for a new CRM module to address the limitations of an existing legacy system.

In the words of the Head of Platforms*:*

> *"Problem is more than just getting people enrolled into [legacy system]. There's a whole realm of life that a student goes through, and we don't integrate that very well".*

However, the strategic level of the organisation did not recognise the value of a CRM module in the university context.

> *""It started there, we recognised the university wasn't ready for such terminology as enterprise CRM" — Head of Platforms*

The middle management had to persuade the senior management to make this investment. As described by the Head of Platforms:

> *"[It took] a lot of consultation, pragmatism — it's an ongoing storytelling process".*

The investment into these modules was of great benefit. The CRM module with a cloud development capability could also be easily used to develop business functionality rapidly, and address the shortcomings of the legacy systems.

> *"So you can pretty much develop anything you want there in the cloud. Code it, support it a lot easier than traditional, preconfigured application that's hosted on premise, which is a lot more restrictive. So we started to use [CRM module] to serve a lot of business requirements that our core applications like [legacy system} couldn't deliver. I guess you could say there's a trend towards cloud, the software as a service, but also platform as a service and [CRM module] is used in that capacity" — Senior Enterprise Architect.*

Another core priority for AU-U was redesigning its operations.

> *"I think new way of working is a massive focus for professional staff and that really talks to our core systems, automating workflow, all those things, providing platforms to allow for rapid development of new functionality" — Senior Enterprise Architect.*

This mission is driving the need for a lot of the business processes to be designed, redesigned or automated.

"We need to automate a lot of processes that are done manually at the moment. We also need to think bigger picture and not just to try and just automate existing processes. We need to look at the actual processes and see where they're not there, […] to find and if they're, you know, not just well defined but well designed as well." — Senior Enterprise Architect

5.3.3 Accelerated DT in Extreme Contexts

The extreme contexts brought on by COVID-19, marked a period of accelerated DT through platformisation for case Alpha. Having begun its DT through platformisation journey two years prior, by developing new digital channels, built on new digital platforms and a more flexible architecture created auspicious initial conditions for the university to achieve this newly posed challenge. The flexible architecture with modules and micro-services allowed components to be reused in different areas of the organisation and for different purposes. Prior investments into SaaS modules for productivity, collaboration and workflow management allowed the university to embrace a fully digital mode of operation in an extremely short timeframe.

In the words of the Head of Platforms:

"Enough people had exposure to both [SaaS modules] for us to go real fast and share it with the rest of the university, once we had to go online. There are other universities that said we have to purchase [SaaS module 1], we have to purchase [SaaS module 2], you know all during COVID. That would have been hard."

Similarly, the Senior Enterprise Architect commented:

"We were in a really fortunate position, where we had all platforms in place to enable that as well".

Ensuring robustness and scalability of modules had been a priority for some time. In addition to optimising costs, there was a strong emphasis on privacy and security of the modules, as well as their sustainability longer term. Modules already in place spanned various functions including learning management, customer relationship management, identity and access management, productivity and collaboration, and digital enterprise workflow management. These provided the necessary foundation for DT through platformisation, while being continually and easily enhanced. Nevertheless, further changes were required to enable new ways of delivering education and remote working. The interplay between the strategic and the digital platform levels at AU-U in relation to their internal and external environment spurred rapid coevolutionary dynamics leading to an accelerated DT though platformisation.

In early March 2020, the newly imposed travel restrictions were starting to impact AU-U's international students. As a strategic measure a number of emergency committees sprang up at the university to strategise in response to the fast-evolving situation. The committees were made up of representatives from different areas of the university and had no official governance. This is how the decision to grant access to Platform Alpha to international students was made. To enable this a new and approved VPN had to be procured as a matter of emergency at the strategic level. Later in the year, a number of learning centres aboard were opened employing AU-U staff as further support for the students.

"There was a number of different committee that sprung up. And you know, no one's got time to be clear on the governance on those committees. It was all scrambled, but I think given that we were all in it, one of the pleasing things was everyone was incredibly cooperative about what they were

doing, how that might impact and what we might need to change and adapt and be flexible." — *Head of Platforms*

Reciprocally, a number of swift activities unfolded in order to enable the opening of access of the digital platform. The digital platform had to be adapted to operational and legislatives constraints of the countries the international students were now residing in. During this process modules deemed unfit were replaced by others.

> *"We had to […] set up VPN connection into [AU-U …] and that took a lot of focus. We ended up using [vendor] infrastructure to do that and I think we're supporting something like 4000 students who are learning remotely […] at the moment. I think going forward there is plans to set up learning centres […], I'm not sure exactly where. There's really great infrastructure for students to go and learn on campus, maybe video-conferencing type equipment and so forth, so they can have an improved remote learning experience as well" — Senior Enterprise Architect*

The early days of the escalating pandemic in Australia forced AU-U to pause teaching activities for a week in a strategic move to transition to an online mode of operation. The pause allowed the university to redesign its activities for the new online channels. A series of swift actions followed at the digital platform level, as well as reprioritisations of existing digital initiatives.

An Analyst/Programmer recalls the challenge of working under such conditions:

> *"…You can't understate how much impact that's had on the way we prioritise our actions and what needed to be done. So things that might not have happened till we were planning for the last year, because we thought it'd be nice to have online, but wasn't a priority, all of a sudden was a priority. It had to be online. Everything had to be online".*

This involved a number of reconfigurations to integrate existing modules for a more seamless workflow. With the strategic level monitoring the external environment closely, a security vulnerability in one of the modules was uncovered through the media. Shortly after, the threat had surfaced at the digital platform level and had been first observed by academics and students. Attackers external to the organisation were able to access and disrupt the university's online sessions. At the same time and in addition to the external threats, an internal issue regarding identity management emerged with the increased use of a ChatU. With the freedom to sign-in with any email address, some users, took advantage of their anonymity by using offensive aliases, with a potential to disrupt and offend other users. Originating at the digital platform level, these threats and issues were quickly reported by the end users themselves and escalated up the chain of command, resulting in the strategic level taking quick action to address the issues.

> *"Luckily the academics involved reported it up the chain fairly quickly and we've actually got some changes to the [ChatU] license. So our central [AU-U] IT department added on some more security measures so that those [videoconferencing] meetings were more secure or that we could be confident that the only people in those meetings were actually students or staff and that was important for the security of staff, but also other students as well. That's an example of how the [IT] department had responded to the situation as it developed" — Head of School*

Both the digital platform and the strategic levels participated in the decision-making process, leading to an accelerated resolution of the issues. The collective action taken resulted in tighter security and identify management controls on the digital platform.

> *"Then as it happened to us, it went up the chain of command […]. So by the time it got through the chain of command, we were mitigating risks by implementing new solutions and new and new configuration options […]. It came to us with a huge amount of urgency, but we were already reacting to it, so we would have had to react with more urgency had we not been on top of that one" – Technical Manager.*

As a result of these decisions tighter security controls and identity management procedures were implemented across the university. This was a confronting time, particularly for the academic staff, forced to utilise the Alpha platform in new and innovative ways in order to deliver teaching. This also highlighted digital skill shortages that needed to be addressed quickly.

> *"In terms of learning and teaching, the distribution of digital skills, pre-COVID was extremely uneven and fairly preference driven" — Executive Director.*

As a strategic measure to address the skill shortages formal training, support and advice was organised by the DT Support Services to support staff, including regular blogs that offered tips on how to use the functionality available on platform Alpha as a whole. With more than one choice of module available, the academic staff needed guidance on what situations appropriated the use of one or another.

> *"So the first thing we did was, made plans to move all services online. With the [DT Support Services], […] we had that quiet visible [..] space, come and chat to us, so we had to work out how to transition that to the online consultations, manage that process. That was done quiet smoothly and quickly. Then it was [updating] the remote teaching toolkit that we had for students stuck in [home countries] and turning that quickly into 'how do I teach remotely?', 'where do I start?' for academics, an action plan for them to kind of follow, what's the most important thing to do in the first week." — Head of Operations*

On the digital platform level, peer-learning networks emerged for disseminating knowledge and sharing best practices.

> *"We started meeting every week and one of the advantages of that was that when people ran into an issue with technology or with anything else there was an immediate [forum] where they could ask their question and other people could share their practice. So sometimes there were people using the same app or same platform, but using it in different ways" — Head of School.*

In addition to upskilling and the focus on the use of platform Alpha, some modules had to be scaled up to support a growing digital workforce. The increasing adoption of productivity and collaboration modules necessitated the scaling up of these modules. The scaling efforts involved needed to ensure there were enough licenses to support the uptake of modules. There were quite a few challenges in:

> *"Trying to make sure that everything was robust enough for that kind of scale" — Support Services Manager*

The move to a digital mode of operation, not only resulted in an increased adoption of modules, but changed the way the modules were used at the digital platform level. The use of CollabU to support the day-to-day employee routines was extended to the teaching and learning context as well. This facilitated easier cross-organisational communication, which previously primarily happened over email. The ability to create private channels was an effective way for groups of all sizes to engage, incidentally mimicking collaboration in the physical world. The option to invite external collaborators, also provided an alternative over email. The flexibility of this module allowed for not just various forms of communication, but also a file sharing function that became the preferred method for accessing documents, as it bypassed the need to go through the university's VPN. The flexible nature of the modules in platform Alpha allowed modifications to be made, much faster than in traditional, legacy systems, which enabled fast adaptation at a crucial point in time for the university.

In an interplay between the strategic and the digital platform levels, platform Alpha started to be used in different ways to facilitate the running of the core operations. At the strategic level, following the success of CollabU in the teaching and learning context, including the ease of document management facilitated, motivated sub-groups of academics to advocate circumventing the official learning management system in favour of CollabU for teaching activities, beyond the collaborative aspects. However, this was not supported by the university, whose mandate was to use the formal systems for managing course material and assessments.

> *"Because it's not an official LMS of the university we couldn't actually do that, so we had to just link it with [learning system]." — Head of School*

Chat modules and spin-up modules on the digital platform replaced events such as Open Days and facilitated support for staff and students. The Head of Operations described it as a:

> *"Low-key part of what you're doing and then it becomes really essential".*

As social distancing measures continued to threaten the execution of exams, the university procured an online invigilation module through an emergency procurement process in a slightly more proactive strategic initiative. As there was no time for elaborate planning, or evaluation, there was some compromise in order to implement the module expeditiously. At the digital platform level, the implementation of the module had to be performed in record speed due to its criticality to the running of a core operational processes. The module was integrated with the university's teaching and learning systems. The implementation of the module was executed in a condensed timeframe.

> *"It was basically a one year project condensed into two months" – Technical Manager.*

The invigilation module necessitated the current administration processes to be redesigned to obtain consent from students, as the existing IT policies no longer fit the new situation. The invigilation module was not adopted across the whole university. Some faculties chose alternative methods for conducting online exams, such as open book or take-home exams. A notable example was the Law faculty, which chose to conduct their exams in this way. The strategic responses presented here illustrate the university's reaction to the crisis to restore order and accelerate DT through platformisation.

On the strategic level, COVID-19 accelerated the DT digital initiatives planned for platform Alpha pre-COVID-19. Originally, the roadmap of digital initiatives to be delivered as part of the DT program and the decommissioning of the legacy system was a 4 year project.

> *"There's now, the expectation that it has to be done a lot sooner. That means that our roadmap in building the ecosystem has to be reviewed to incorporate the portfolio solution, as a priority" — Technical Manager*

As restrictions eased up, it became clear that some changes would have a long-lasting effect. Although education may not be run entirely remotely, there is a trend towards a more hybrid form of teaching and learning and further investments will be required to enable that.

> *"Next year the focus is really going to be, they call it hybrid learning which is where an academic could teach students who are both on campus and remote at the same time, so whether or not that's actually broadcast type infrastructure in lecture theatres, you know, they allow the on campus and remote students the same quality of interaction and learning at the same time" — Senior Enterprise Architect*

As the pandemic showed signs of slowing down, other priorities emerged through student feedback that needed to be addressed, especially in light of an increasingly digital model of operation. Student comments suggested better feedback was required from the academic staff to support them better. While AU-U needed to find ways to assist academics in formulating better student feedback, it also needed to be pragmatic to avoid excessive amounts of time and effort. The proposed solution came in the form of automated feedback. The automated feedback module was introduced and integrated into platform Alpha in 2021.

> *"Feedback tools are really important, building and feedback loops into learning, so that'll be one of the things we'll be working on next year […]. You know, it's really something that we know is really critical to students learning, something we know that can be improved is the ability to receive feedback from academics and to know what it's designed to do and to give academics where to do that, efficiently at scale as well" — Head of Operations*

The process of DT through platformisation on platform Alpha continues to evolve as a result of deliberate action and emergence. The processes driving DT are both top-down and bottom-up.

> *"There's certainly a lot of drivers from that top level university management. That isn't to say that, there is still some flexibility at the subject level for an individual academic to use whatever tools they have available or whatever tools they think are appropriate." — Head of School*

In summary, case Alpha demonstrated AU-U's transition from legacy systems to a digital platform architecture, which was instrumental in positioning the university as a digitally-enabled organisation. As a result, AU-U was able to overcome challenges presented during the COVID-19 pandemic. Next, I present the findings from case Beta, a different kind of digital platform, built for a different purpose.

5.4 Case Beta — Collaboration Platform

Platform Beta is an example of a new digital platform at AU-U emerging through design. It was launched in December 2019 as a strategic initiative by AU-U to uplift its research function and improve the researcher experience. The journey of this nascent digital platform can be delineated into the following phases, summarised in Table 24 below. Each phase is evidenced by a coevolution between the organisation's strategic level and the digital platform. In case

Beta the emergence and evolution of a collaboration platform was observed as a result of initially deliberate strategic effort and subsequent emergence.

Table 24 — Phases in the development of Platform Beta

Time period	Phase	Description
August to December 2019	Inception	A basic version of the digital platform was launched.
January to March 2020	Germination	The digital platform continued to evolve through deliberate and emergent design.
April 2020 – Present	Growth	The platform started to experience growth fuelled by COVID-19 and an increase in reliance on the digital platform.

5.4.1 Inception

Discussions around platform Beta started in 2018 when the initial project team was formed. The inception phase marked the emergence of Platform Beta between August and December 2019. The strategy behind platform Beta started as a vision by the deputy VC to uplift the research function and improve researcher experience. It strived for a united research function, that would connect the different research areas within the university and have the ability to be opened up to external collaborators in the future. This broad vision was realised in December 2019 with the launch of Platform Beta. At launch, the digital platform was a basic offering providing researchers digital resources, training programs, links into different research-related modules developed in-house, as well as third-party offerings, including an event management module for booking events.

The overall digital platform design can be broadly divided into interface design and the architecture of the digital platform. The initial interface designs were produced by a UI designer. Moreover, the interface design of the digital platform also helped to inform the wider university style guide. Platform Beta, like all AU-U platforms was bound by AU-U's architectural standards.

> *"I would say [Platform Beta] like any other project […] has to adhere to these architecture principles and the standards." – Technical Lead*

The technical solution involved decoupling a monolithic content management system used across the university into a multi-tenanted architecture, capable of supporting multiple semi-autonomous digital platforms. However, this was a deviation from AU-U's architectural principles.

> *"Initially it was a massive battle in getting the university, convincing the university that we should be able to set up [platform] instance outside of the [university's] main [platform] instance." — Product Owner 2.*

Platform Beta therefore had an influence on the broader AU-U architecture by making it more flexible. As the Senior Project Manager points out:

"We pioneered that".

The architectural design of the digital platform had to be ratified by the university's Architecture design department, to ensure it adhered to the architectural principals and standards. A Senior Enterprise Architect described the ongoing process as follows:

> *"… Different designs are presented, critiqued, feedback provided and eventually with modifications based on that feedback approved"*

The approval process was twofold, starting with the approval of the design by the Architecture design department, and later by the Architecture governance board, as the Senior Enterprise Architect explains:

> *"The governance process for bringing new systems into production".*

The events functionality was provided by a third-party module, which was integrated via an API. As the external module is used by other areas of the university, a business process was implemented for displaying exclusively Platform Beta related events, as it was not possible to automate this in the module. Another limitation of the external third-party module caused Platform Beta to deviate from its architectural principles in the short term. This was raised as an exception and had to be approved by the Architecture governance board. The third-party events management module has the capability to create registrations, issue tickets and collect payments if applicable. The registrant data can also be linked to a CRM. Starting out as a grass-roots module, it was quickly adopted across the whole university. The next phase marked a germination of the digital platform through deliberate and emergent design.

5.4.2 Germination

Following the initial set up of the digital platform, the next stage of its development ensued between January and March 2020. A dedicated multidisciplinary team was set up to elaborate on the vison and design the new digital platform. Platform Beta was to have a physical space complementing the digital platform. The physical space was to contain collaboration facilities like meeting rooms, spaces for holding events and recording studios.

Key stakeholders from the university worked with internal and external consultants to elaborate on a vision for Platform Beta. The initial strategy was formulated in a workshop between an external consultant and representatives from different departments and faculties from the university, as well as a human-centered design specialist from within the university. The role of the consultant was to help AU-U better integrate the physical Platform Beta space and the digital platform into a seamless experience.

> *"We got an external facilitator in to drive the strategic workshops, and then a specialised human-centered design person then to work closely in doing human-centered design work with the key stakeholders within each of these strategic opportunities that we identified" — Program Manager*

A workshop was held by the Human-Centered Design department, where the participants had the opportunity to communicate their vision using the Lego Serious Play method. Utilising the Lego Serious Play method, the workshop attendees defined some high-level pillars for the digital platform to guide future initiatives. This was deemed an effective method to help participants visualise the new digital platform.

> *"It's a really good way to help people visualise what they think they need in the future, what they have today, and how they can connect to anyone else,*

and what the future could look like. […] Lego works better than words, in many ways, it helps people to sort of articulate what they think they're trying to get out of the whole tool or the system" — Senior Project Manager.

During the process, some ideas were discarded and further details elaborated, as the group worked towards formulating a vision for the digital platform.

The information from the Lego Serious Play workshop was collected, synthesised and discussed in a follow-up workshop to ensure agreement between stakeholders. The key information from the follow-up workshop was then presented to the solution design team in a separate workshop to get their feedback and further synthesise the information.

The working strategy was then presented to the research systems committee, different research areas and the library to collect further feedback. Following the strategy workshop, a working group was designated to plan the design, identify and prioritise objectives for the digital platform. The working group consisted of representatives from multiple faculties and departments in the university. This iterative process led to the development of high-level design principles and the objectives for the design principles.

"So the roadmap was really defining what it is this this [platform] is supposed to be, and how we can then break that down to deliver that. And add value to the users" — Senior Project Manager

During the articulation of the general strategic direction and design principles, possible features for the digital platform started to emerge. Once the objectives were articulated, the group worked on prioritising those objectives.

"A series of workshops happened which really drill down into, ok these are the features that we're going to add. Then we went and decided on the priorities that were signed off" — Change Manager.

Cross-organisational and external consultations were also observed as Platform Beta team engaged with both internal departments and other universities in designing its platform. The aim of engaging with other universities, both national and international was to get a better understanding of how they had architected digital platforms with a similar purpose and the benefits they were getting out of them.

"We're also looking at what are, what other universities are doing in the research domain. We've talked to a bunch of them […]. It was to see how they've structured their [platforms] and what benefit they're getting out of it. So we're getting both internal and external influences" — Senior Project manager.

As the digital platform grew, Platform Gamma was consulted for advice on how to integrate more High-Ed M modules.

"There was a discussion of how we're going to integrate more [High-Ed M] modules into [Platform Beta] and we had a meeting to explore how [Platform Gamma] is functioning, so that we can take and adapt this model to [Platform Beta]" — Business Analyst

An operational inefficiency was identified in access to funding opportunities. The funding opportunities used to be aggregated by the Central research department. Only a small percentage of these would then be emailed out. Email was deemed an inappropriate medium for this purpose, as a lot of people could miss or delete emails unintentionally. One way to

address this challenge was to build this functionality into the digital platform for the researchers to be able to search, order and filter opportunities, as well as adding tagging for coding and personalisation. These opportunities would also be linked to events and webinars on the digital platform to further support one's professional development. This new feature also required a business process change. The opportunities previously emailed to researchers were now to be updated on Platform Beta. There will be an opportunity for users to subscribe and receive notifications when new opportunities are posted on the digital platform.

> *"Currently there's a process within the research office they aggregate all of these funding opportunities that are out there and they only email a small percentage of them out. Email is not a very useful platform. Many people like me delete their emails if they're not interested […]. There may be funding opportunity that's good for you as a researcher that will do better for your career but you can't see it right now" — Senior Project Manager*

There was a big focus on reusing existing technical components during the design and the development of the digital platform.

> *"We're trying to avoid changes that are specific for a particular application and we're trying to build these "build once use many times". "That's the approach we'd like to take from an architectural view point to support things such as [Platform Beta]." — Senior Enterprise Architect.*

Senior Enterprise Architect adds:

> *"We're going to be reusing a lot of the systems that we already have".*

This was confirmed by the Technical Lead:

> *"General guideline is that they want to reuse existing."*

As example of a shared module is the third-party events module.

> *"The [events module] we were using was not dedicated for [Platform Beta]. It was something to be shared between [Platform Beta] and potentially other faculties and departments etc., mostly faculties" — Senior Enterprise Architect*

When AU-U procures an improved events module, Platform Beta will need to be updated too.

> *"We want to improve that [events module] so that the next [platform] that wants to have events will be better, you know. I really want to hope to retrofit [Platform Beta] with whatever we improve our events management with" — Senior Enterprise Architect.*

Designs that deviate from these reuse principles need to be approved by the Central Architecture Board.

A Technical Lead comments:

> *"If it is within [CMS module] and if it's out of the box module we can reuse, yes then I think it should not be a problem getting it ratified by the [Central Architectural Board]."*

Another architectural priority was building a catalogue of generic modules that can be easily reused across AU-U.

> *"If someone comes along and says this is what we want to do, we want to be able to say: "[…] just use this one here" as a micro-project or a business as usual project to make this accessible for this particular [platform]. […]The different areas could learn off each other. If lets say [a department] decided they wanted this, […] it's now available and we can set it up in a couple of weeks." — Senior Enterprise Architect*

The COVID-19 pandemic did not have a significant impact of Platform Beta, apart from delaying the opening of the physical space and the transition to remote working. However, it did have an impact on the prioritisation of the digital platform's objectives.

> *"COVID-19 is always considered to be a higher priority over everything else" — Technical Lead.*

With a growing number of podcasts and video content, especially during the COVID-19 pandemic, when online content was prioritised, it was recognised that a different media management module would need to be used to support the scale. A third-party cloud media storage and management module was integrated via an API, which also became the preferred module across the university at this time.

Another example of reuse was the implementation of a previously developed feedback module by reusing existing code created by a developer. Focusing on optimising the user experience, the module went through a redesign to make it a better fit for the digital platform.

> *"That didn't look user friendly or accessible. So I suggested a different interface and we introduced some new elements in the module" — UX Designer.*

The integration of the feedback module was critical for the subsequent digital platform designs, as it actively engaged the user communities to provide feedback. Another characteristic of the digital platform development was the use of low-code modules enabling a wider range of stakeholders on the team to design features, not necessarily only technical staff. This empowered business users to engage in digital platform development. A module where users could make bookings for the physical space was assembled via a CRM module plug-in. It was relatively simple to configure, with no programming knowledge required.

> *"You don't have to be a programmer to do it, an end user can do it" — Technical Lead*

The next stage marked a period of growth for Platform Beta, as it gained momentum in the research community.

5.4.3 Growth

During the Growth stage the value and the purpose of the digital platform was quickly recognised in the university with unique monthly user numbers rising steadily. Platform Beta continued to evolve as both a result of deliberate strategic direction and emergence. Unlike a traditional IS project, with strict pre-defined requirements, the design of platform Beta evolved in a largely open-ended way. As the Business Analyst explains:

> "*All of these questions are still evolving, although the [platform] is up and running".*

Agile methodology was adopted to deliver functionality incrementally, while having the flexibility to rapidly reprioritise objectives on a regular basis. The Product owner 1 comments:

> *"I've always described it as an ecosystem. And that's because I wanted to create a sense of evolving and having an iterative lived experience to the user. And that it would evolve as our needs and the capabilities and capacities and the research strategy evolved. It would evolve in alignment with that."*

The end-users played a pivotal role in the evolution of the design for the platform. In the words of Product owner 2:

> *"It's not like we gather some requirements, do some user testing, and then modify slightly. It's actually the user testing is continuous".*

> *"The trouble with what we're trying to do is, is not in any way shape, or form a standard [IT] type project, because at the outset, although we have high level design principles, we actually don't know what we're going to build."*

The main challenge of the experimentative nature of this endeavour, was the need to shift mindsets and the way people worked. This way of working required a fundamentally different approach — one that accepted failure as part of the process of experimentation. For a lot of the project members this was stepping out of their comfort zone.

> *"I think there have been elements within that conversation that are, they're outside of their comfort zone, in terms of deliverables, and how they're going to be assessed in their work. With that sort of more freeform way of working. As a researcher, I'm very familiar with that way of working. I'm quite comfortable with that idea that, look, we've got some goals in mind. We've tried to set ourselves targets. If we don't get them all, that's fine. That's the nature of research. And then sort of you go backwards and forwards. Hopefully you ultimately go forward. But you also go backwards at times as well and that's not a problem. I think that's been more difficult for other members of the team to adopt that way of working. Equally, though, on our side coming from a research background, it's been difficult for us to adopt a much more project focused way of working. You know, you have a scope of works with very well defined deliverables, and so on, so forth. And you must meet those deliverables and etc, etc". — Product Owner 2*

It was evident that platform Beta was not simply a technology change. Essentially, it was attempting to change the culture at AU-U.

> *"[Product owners] are trying to do something slightly different. They're actually trying to change culture as well. So that's a bigger piece. It's not just that they want to know the process that we're doing. They want to make sure that the process we're doing will also help them to change culture, but then it's actually almost bigger than the technology that we're trying to implement" — Senior Project Manager.*

As subsequent iterations of the digital platform were released, feedback was collected through a variety of mechanisms and informed the future iterations of the digital platform.

"So this is really key for the strategy to work, because so far it's been opinions based on stakeholders and influencers. Now we can start getting feedback from the users or what is valuable to them" — Project Manager.

At the same time, deliberate experiments allowed functionality to be released quickly and for feedback to be collected. Regular design sessions were set up where stakeholders could share ideas in an open forum in line with the culture of experimentation encouraged by the strategic level. This was considered a very effective method in ensuring all the stakeholders understand what the goals are and how to accomplish them in designing the digital platform.

"That just allows us to sit with all the stakeholders, anyone can come to that meeting, and we can present or talk through the ideas that we've got, and then, think back on it so that we can move that thinking along, quicker." — Senior Project Manager

It also allowed the team to deliver new functionality quicker.

"So what we're doing is putting up some easy wins, some sort of minimum viable product around personalisation, and then seeing what people are using, and creating some persona worker profiles from that of who's using it, and who is doing more to then see how we can meet people's needs more effectively."— Product owner 1

The feedback collected helped aid in making further adjustments to the digital platform.

"Sometimes, best endeavours are going out there, what we think they may want. Once they start using it, we have to change things around a little bit." — Program Manager

An example of a feature identified through user feedback, is a live chat module. The purpose of that function would be to have a dedicated resource available to be contacted, possibly offer training, or help in providing information. Before this functionality can be introduced a complimentary business process needs to be designed.

Platform Beta continues to evolve with a number of planned features in the future. The next goal for platform Beta is to build a workspace for collaboration with internal and external parties. However, at this stage it is still unclear how this function will look. There are also plans to build customisation into the digital platform, so once an internal party signs in with their central university account they will be able to personalise the digital platform according to their needs. This will be achieved by assigning different roles to users (e.g. researcher or author). The functionality available will be displayed according to the user's role. Initially this feature will be for internal users only. However, in the future there are plans to extend this to external parties. They will have to be identified with a role before they can access the feature.

The work on personalisation will further inform the university's broader efforts for single sign-on identity management. There is currently no clear plan on the strategic level how this will be implemented. It will be relying on a taxonomy of roles developed for Platform Beta on the digital platform level.

"We had an alignment meeting with the solution designer who's working on this and he specifically said he doesn't have enough framework to give us guidance, but he's involved in everything we do. He can learn from what we're doing and also make sure if something does come up how he can grandfather that back in." — Senior Project Manager

Once the work for platform Beta personalisation evolves, the AU-U strategic level will be in a position to adjust and make changes appropriate across the university. Once the strategic level finalises the sign-on and authentication functionality, university-wide, Platform Beta will need to update its own taxonomy behind personalisation. This is an example of both top-down and bottom-up influencing at AU-U. Further to this example, the work on research systems performed at the strategic level, for the central research department, will also need to inform Platform Beta.

The evolution of Beta led to the emergence of an internal ecosystem connecting different stakeholders, normally constricted by siloed ways of operating, including students, professional staff and academic staff across the faculties. This enabled greater collaboration across the university, dissolving organisational silos and providing greater unification of the research function. The longer-term vision is for the digital platform to enable external collaboration as well.

In summary, case Beta allowed the university to uplift its research function. As a new digital platform it also helped to drive the introduction of new processes, while continually being shaped by stakeholder and user feedback. Next, I turn to case Gamma — a digital platform, which helped AU-U remain competitive in an increasingly digital world.

5.5 Case Gamma — Innovation platform

Platform Gamma, a novel digital platform at the university was introduced to offer new digital value propositions, separate to the university's traditional offerings. The digital platform emerged as a result of first partnering with an external platform provider to deliver a prototype, followed by the procurement of modules that later formed what is now platform Gamma. It became a first of its kind e-commerce platform at AU-U. The development of the digital platform was marked by three phases, described in Table 25 below.

Table 25 — Platform Gamma phases of development

Time period	Phase	Description
2016-2017	**Inception**	Reconceptualising the postgraduate strategy and setting up a pilot on an online platform.
2018-2019	**Germination**	Procurement of HighEd M module and a digital experience module with e-commerce functionality, resulting in a business model change.
2020-Present	**Growth**	With COVID-19 and the increase in online content, the digital platform continued to grow and expand into new markets, resulting in another business model change.

5.5.1 Inception

In 2016, a decline in postgraduate numbers prompted AU-U to begin strategising. Market research revealed a trend towards online learning and shorter forms of learning, a very competitive market. A new strategy was introduced for reimagining the postgraduate experience, by redesigning existing and introducing new products. The products were to cater to time-poor industry professionals, looking to update their skills, but preferring more flexible arrangements. The strategy for platform Gamma unfolded as a dynamic process between the faculties and the team leading the strategic initiative.

In the words of a Strategy Analyst:

> *"So really what we were working on in postgraduate education fit in very, very well with the overall strategy that the university then developed and we had already set the groundwork for a lot of the strategy in [one of the tenets] which was all about increasing flexible offerings, looking at smaller chunks micro-credentials, online learning, but also what we have been concentrating before that was an uplift for our whole postgraduate curriculum and how that could be digitally supported better".*

A cross-organisational strategic governance model was set up for Platform Gamma.

> *"We established very early on a [steering group] […], where we identified the key people within the faculties who were driving postgraduate education" — Strategy Analyst.*

The steering group was responsible for strategising with the faculties to articulate a broader vision for the platform.

> *"So we involved [steering group], you know, met once a week with them, but also developed individual faculty strategies, again looking at teaching and learning requirements, so that's the direction I come at it from. It's about student experience, it's about engaging students. […]." — Strategy Analyst*

This phase lasted until 2017, followed by a Germination phase when the digital platform developed further.

5.5.2 Germination

In 2018, following the revamp of its postgraduate strategy, AU-U engaged with an external consultancy to develop the initial version of Platform Gamma with a suite of initial offerings. A third-party SaaS, online platform — Digital Learning (pseudonym) was used to design and launch an initial suite of taster courses.

> *"This website wasn't really a dynamic website, but we started off with about 12 tasters or so and we also utilised an external provider for learning and they created a few products as well – on the [Digital Learning] platform as well. So yeh, that was 2018, but the whole process started in 2016." — Strategy Analyst.*

This was meant to act as an interim solution, while AU-U was in a process of procuring HighEd M.

> *"[Consultancy], so they just provided an interim solution – a website for us to initially roll out the digital platform with some initial suite of tasters. It was*

> *never meant to be a permanent solution. […] We were going through a major, major procurement effort.“ — Strategy Analyst.*

The procured High-Ed M was a stark contrast to the AU-U legacy learning management system. It allowed AU-U to design its new value propositions for the postgraduate market in the form of short forms of learning. At this time, a pilot with the new High-Ed M module was done for a select few postgraduate courses. Eventually this module was selected to host all postgraduate offerings, and later all AU-U offerings. High-Ed M allowed AU-U to maintain and improve its existing traditional offerings, while at the same time engaging in new value propositions.

> *“We can still deliver a good, cohesive learning experience for undergraduates and postgraduates […] but we can also section off areas of [High-Ed M] to be able to offer short courses and micro-credentialing, as part of maintaining economical viability.” — Technical Manager*

High-Ed M was seen as a strategically better fit than the university’s current learning management system, which was inefficient, not user-friendly and had no ability to evolve to meet the newly imposed market demands.

An external consultancy was hired to develop the full platform Gamma including a customer-facing front-end and a back-end solution. The back-end solution of the digital platform included a module with CMS and e-commerce functionality (DigiCom) — pseudonym. The external consultant led the design and architecture of the digital platform including integration with core existing systems via an integration platform. Other components included a CRM module, HighEd M, a payment gateway and an existing financial system.

The newly emerging business model of shorter forms of learning required a whole new team to be set up at the strategic level to drive the efforts of designing the new products. New talent was hired externally to fill the newly designed roles based on specific expertise in learning design and media management. The team worked directly with the faculties and the academic staff on the redesign of existing and the design of new products. Platform Gamma was a true departure from the university’s traditional value propositions to a new business model supporting a fusion of online and face-to-face learning, to eventually offering fully online courses.

> *“[Platform Gamma] provides an opportunity for the broader community to connect with our educational offerings, not just students enrolled in formal degrees. This ability to constantly learn new skills is becoming increasingly important across all tiers of the workforce.” — Courses and Marketing Manager*

The next phase was marked by growth for platform Gamma.

5.5.3 Growth

Following the Germination phase, the digital platform evolved into a full suite of offerings, including other short courses, micro-credentials and fully online degrees, designed using High-Ed M. Once COVID-19 disrupted AU-U operations in 2020, for Platform Gamma, which already had online learning as part of its value proposition, the impact was smaller. Having the digital platform in place, it required just the face-to-face components to be integrated into a fully online experience. However, upcoming work on the digital platform had to be reprioritised to meet higher AU-U goals at the time. The Strategy Analyst comments:

> *"All that work since Coronavirus has completely been swapped over [to put] all of our forces online quickly. That's been a huge effort that's diverted resources away from what's been the core business. We've also had huge income targets put on short courses for all the faculties. So that also has changed the landscape a little bit as well and of course a lot of enrolments of those have tanked in the last few months. Nobody is doing any of the face-to-face courses. Everyone's saying how can we pivot, move that course to wholly online?"*

With a significant portion of the revenue lost from the international student market, AU-U sought other strategic directions. In an industry collaboration initiative, AU-U formed strategic partnerships with industry partners (large organisations) wishing to upskill their staff. The courses were co-designed between the enterprises and AU-U, but also open to the general public after a certain number of spaces had been allocated to the client organisation. This means they were not tailor-made, but open to the public for the community to benefit as well.

> *"We didn't want to build something that will be bespoke product for [client organisation]. From the beginning we wanted to build micro-credentials that can be offered to the public as well and to other companies and [client organisation] was very happy with that, and they also didn't want something that would be [client organisation] specific." — Deputy Head of School*

The courses were smaller than the traditional offerings, lasting weeks in duration. The strategy for engaging with industry partners relied on reusing the existing modules and assets to deliver a new value proposition. The move also supported the nation's goals for a post-COVID-19 skills uplift. Although planned prior to COVID-19, the initiative was executed during COVID-19, without any major deviations to its plan. The Program Coordinator commented:

> *"So running as a fully online, even without COVID I think it would still be a fully online environment. If anything, everything that happened with COVID kind of helped prepare us for that online learning environment, making sure that it was up and running smoothly. We had experiences from our undergraduate and postgraduate subjects, [HighEd M] was off and running. Everyone was aware of using [CollabU and ChatU] and that kind of thing for teaching. Doing it all online was a smooth transition".*

Similarly the Deputy Head of School notes:

> *"It didn't affect us much because the [client organisation] contacts we had and we talked to, they were, they are in [another Australian city] anyway, the learners are anyway online because they are abroad, so there wasn't any. It was supposed to be online only from the beginning. So it was never supposed to be sort of face-to- face training".*

As the value creation process moved from inside the organisation to co-creating value with industry partners, this created an external ecosystem consisting of AU-U, client organisations and the general public consuming the courses. The collaboration also led to the emergence of a new team structure made up of internal stakeholders from different organisational units, as well as external stakeholders. Products were designed in a collaborative process between AU-U and the client organisation in a workshop setting. Each iteration received feedback from the client organisation, which was assessed, prioritised and implemented. The products were designed in a compressed timeline engaging in the simultaneous design and delivery.

During design and delivery, a lower-level monitoring process was implemented at AU-U. Through this process any issues, but also new requirements could be identified that led to the creation of new products.

> *"[Products] have been built in line with the client's expectations. What we do is that we monitor that very carefully" — Industry Collaboration Manager.*

Also, more rigorous quality assurance checks by the central university team were involved in product design for the enterprise market. The process differed from other university's mainstream products.

> *"The quality assurance check essentially to make sure that what was facing other business clients is of high quality." — Program Coordinator*

During the co-creation process, new requirements emerged at the digital platform level. There was a need to adapt platform Gamma for the B2B context. To cater for a more personalised experience, a customised instance of High-Ed M was set up for each client organisation. Moreover, as the number of enrolments increased, the existing manual processes conducted through a spreadsheet became inefficient. To address this shortage a new dashboard module was developed for the client organisation to administer their learners. Another example of an emergent requirement was a module — SkillU (pseudonym) built for businesses to assess the current skill levels of their workforce, by analysing their CVs and determining what roles would be suitable for them in the future. This included the skills required for those roles and the courses they need to develop those skills. Following this process, they would be enrolled into those courses.

Platform Gamma continued to evolve with more requirements arising from the interactions with external partners.

> *"Whole functionality of [Platform Gamma] is currently being revisited to give a better consumer experience for business owners." — Industry Collaboration Manager.*

One such requirement is greater access to systems granted to client organisations.

> *"There's external requirement, external business need; how we actually morph our technology into service." — Head of Platforms*

AU-U will need to go through a further transformation to be structured in a way that facilitates the B2B model to scale.

> *"If I go on to [Platform Gamma] and I see a course that I might want 20 of my staff to do, there's no way for me to bulk enrol people. I have to do one at a time. […] So making changes to our technology that allows a company to come in and say 'I want to put 20 people in this course', those sorts of things we are working on at the moment."— Industry Collaboration Manager.*

A new sub-brand had to be developed to distinguish new offerings from the university's core products (traditional education).

> *"We're still finding our feet a little bit to try and figure out exactly what the market needs. Universities aren't necessarily the people that organisations think about when it comes to this style of learning. So it's a very new market for a university. We have to, not only build a reputation, but we have to build in industry knowledge, that this is actually what we do, because we're not*

the natural first thought for most organisations. So it's at the same time as we're building products, we're also building reputation and brand awareness and we've actually got to come up with a, basically a sub-brand for [the industry collaboration initiative] [...]. So we have a sub-brand around [the industry collaboration initiative] because we needed to differentiate. What we do is not business as usual." — Industry Collaboration Manager

To be able to fully embrace the challenge of this new line of business, AU-U is currently in the process of adding a new digital experience module to Platform Gamma.

In summary, the findings of case Gamma demonstrate the significance of this digital platform in the realisation of AU-U's strategic goals. By allowing the university to reimagine their traditional offerings through new value propositions, Gamma proved instrumental in maintaining AU-U's competitive advantage. Next, I present the organisational outcomes observed, as a result of DT through platformisation, achieved through the three cases discussed.

5.6 Organisational Outcomes of DT through Platformisation

A number of different cumulative organisational outcomes have been observed, as a result of DT through platformisation through these three different cases. These are business model transformation, operational efficiency and organisational resilience. In addition to three different types of internal digital platforms, I also observed the emergence of two different types of ecosystems (an internal and an external ecosystem). The outcomes are described in more detail below.

5.6.1 Business Model Transformation

Two main business model transformations were witnessed through platform Gamma. These transformations were complete deviations from the university's traditional value propositions. The first change resulted in a new business model, offering blended and online-only short courses and micro-credentials to the postgraduate market.

"I think the key call out is to highlight that this is an e-commerce platform and an e-commerce business which is a first for the university. So we're entering kind of uncharted and a new way of operating, so it's a really new and different business model to what the university has ever experienced or gone through." — Communications and Marketing Manager

The second business model transformation was the move from a B2C model to a B2B business model by offering short courses in different areas of expertise, targeting large organisations looking to upskill their workforce. This change ultimately led to a B2B2C relationship, as B2B products developed with client organisations were opened to the general public.

The shift in partnering with the industry to deliver education required a new brand to distinguish this type of teaching and learning from the university's traditional business model of offering undergraduate and postgraduate formal education.

"Because we're not the natural first thought in most organisations. So, it's at the same time as we're building product, we're also building reputation and brand awareness and we've actually got a […] sub-brand […] because we needed to differentiate. What we do is not business as usual. It's not degrees, it's not postgrad, it's something very different. So we needed a different […] persona around that. That's something we're in the middle of

right now is trying to build that brand so that people understand that it is different to what a university typically does. […]. So we're trying to set ourselves apart from that, say this is not BAU. " — Industry Collaboration Manager

5.6.2 Operational Efficiency

Operational efficiency was observed as one of the outcomes of platforms Alpha and Beta. A number of inefficient processes and siloed ways of working were overcome with these platforms. The platformisation observed in case Alpha led to a modernisation and streamlining of the technical landscape, resulting in improved efficiency and a better experience for the students and staff. Operational efficiency was realised on Platform Beta by improving a number of manual, inefficient processes by moving them to the new digital platform and linking all the relevant research-related modules into a single platform, whilst continually evolving the value propositions. For example, the funding opportunities on platform Beta helped to bring to the fore a vast amount of information and opportunities that were previously obscured to researchers. This also enabled researchers to make better decisions regarding their careers by having a more complete overview of the research opportunities and funding available.

"So the objective is to create context rich scaffolded differentiated interface for research funding opportunities […] also cross-referencing those links to events or webinars that support your professional development." — Senior Project Manager

Platform Beta also relieved the administrative burden of managing certain processes via email, as they were now all on the new digital platform. The better integration of researchers and faculties, as well as a unified access to systems led to improved collaboration.

The emergence of the digital platforms was mirrored by physical, dedicated organisational components, supporting the digital platforms. For example, physical spaces emerged to compliment the digital platforms and provide operational support. For platform Alpha, a new department emerged, under a unique brand, mimicking the Apple's Genius bar and offering collaborative spaces, consultation and support for the academic staff. The consultation involved not just support and maintaining the status quo, but challenged the staff to adopt new practices and digital platform modules in their work. For platform Beta, a physical space was also opened to complement the digital platform, offering collaboration, events and support for researchers.

5.6.3 Organisational Resilience

Platform Alpha was instrumental in enabling organisational resilience during the COVID-19 pandemic, by supporting the core operations (i.e. including teaching and learning, management of exams and new ways of working). This was done by providing a way of continuously adapting to the changing environmental conditions through its different modules. Beyond the teaching and learning aspects, some components of the digital platform — such as CollabU and ChatU have become instrumental for professional, as well as the academic staff at the university to support new ways of working.

In this chapter, I presented the empirical findings, corroborating the DT through platformisation efforts at AU-U. The three digital platforms led to a number of cumulative outcomes, which continue to evolve. Next, I present my theorisation of DT through platformisation as the result of multilevel, coevolutionary effects.

Chapter 6: Theorising DT through Platformisation

In this section, I propose a theoretical model and mechanisms of DT through platformisation, based on the empirical insights from the three case studies, interpreted through the lens of coevolution theory. To derive the theoretical model, a more holistic view of the coevolution theory was applied, examining the relationship between the external environment and the organisational-level adaptation. By focusing on the level between the organisation and its environment helps to bridge the selection-adaptation single-lens explanations that have dominated research for years (Volberda and Lewin 2003). The mechanisms of DT through platformisation are based on the micro-level, or the intra-organisational perspective.

6.1 The Theoretical Model of DT through Platformisation

The model presented in Figure 7 represents a theorisation of DT through platformisation.

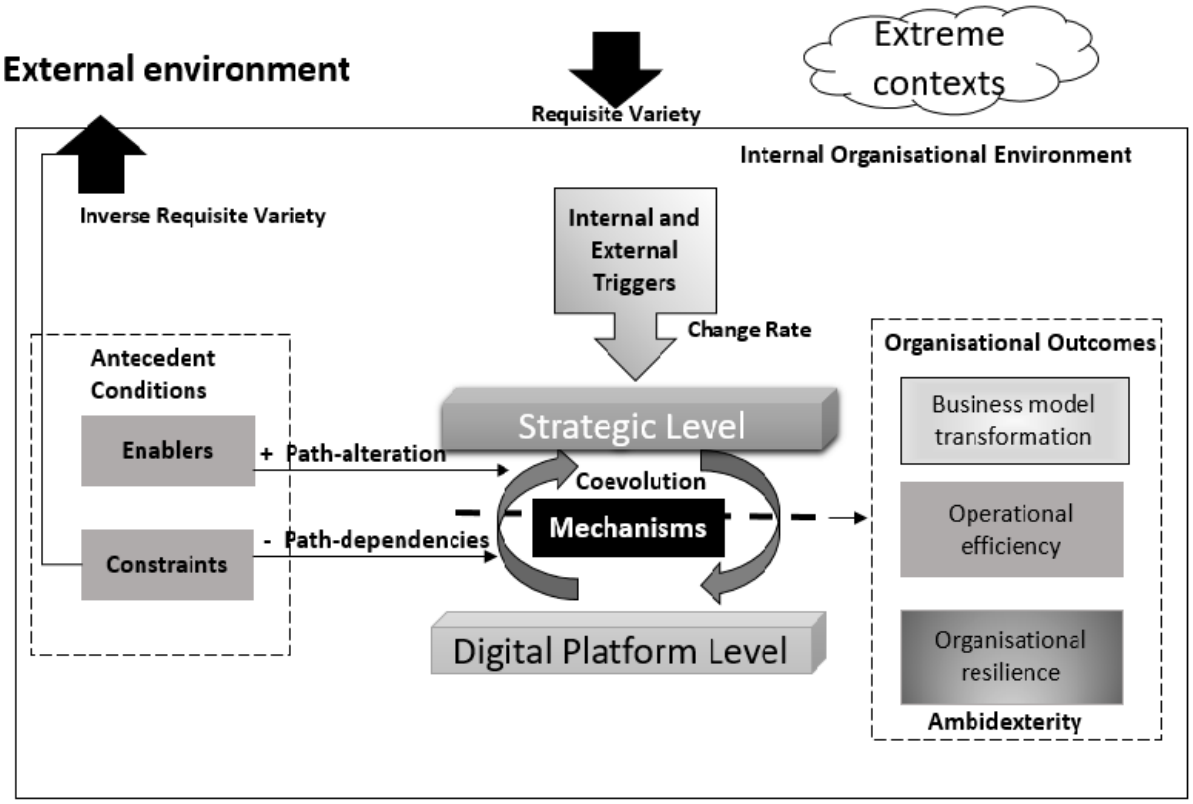

Figure 7 — Theoretical model of DT through Platformisation

The *external environment* represents the exogenous influences on the organisation, shaped by political, social and economic factors. *Extreme contexts* refer to the complex and chaotic conditions brought on by changes in the external environment, such as a crisis (e.g. COVID-19). The *organisational context* consists of the internal organisational environment consisting of individuals, organisational units, structures, systems and culture. A change in the external environment generates an adaptive response at the organisational level. The organisational level can equally influence its external environment (Maitlis and Sonenshein 2010), however that has not been the focus of this study.

The *triggers* that set coevolution into motion can be external or internal to the organisation. *External triggers* incite a need for adaptation based on the principle of *requisite variety,* that is the rate of internal change must match or exceed that of external change. Examples of external triggers at AU-U include market shifts instigating the revision of the postgraduate

strategy leading to the emergence or platform Gamma, as well as the events of COVID-19 causing abrupt and rapid changes to the digital platforms.

Internal triggers can also set off DT through platformisation into motion, irrespective of external triggers. At AU-U examples of internal triggers include the decision to move all offerings onto HighEd M and decommission the legacy system to avoid the cost of running two systems in parallel, as well as the need to enable secure collaboration with external parties through a digital platform.

Based on the coevolutionary principle of *change rate,* the adaptation can only advance at the rate that usable variation becomes available (McKelvey 2004b). Increased variation can present itself in a number of different forms; e.g. new knowledge creation leading to new products (Eisenhardt 1989b), or the introduction of new software (Vidgen and Wang 2009). At AU-U, the introduction of HighEd M created the increased architectural variation to enable a wider DT through platformisation effort. The CollabU module, on the other hand, provided the ability to easily configure specific access rights by giving certain external domains the ability to communicate and collaborate with AU-U staff. In the words of the Platforms manager:

> *"So what we've done so far is we've just, we've taken it one step at a time. And as of today, we can add people from any Australian government domain. So if I'm working with a local state or federal government contact, and I can do that today, same with an Australian education, email address or any other Australian University."*

Antecedent conditions are the factors that can either enable or constrain the DT through platformisation process and can be either endogenous or exogenous to the organisation. *Enablers* are the favourable conditions allowing DT through platformisation to unfold, theorised here through a new proposed property of coevolution — *path-alteration.* An example of an internal enabler at AU-U was the introduction of a cloud strategy, which made the infrastructure more flexible and adaptable to change. Cloud infrastructure allows for effortless scaling up or down of IT infrastructure according to demand, which is not possible with traditional on-premise infrastructure (Battleson et al. 2017). In a similar vein, the cloud strategy allowed AU-U to forge a new path, deviating from its rigid structures and technology. An example of an external enabler was the government's post COVID-19 recovery agenda for upskilling through micro-credentials.

Constraints, on the other hand, represent the internal resistance to the DT through platformisation efforts, interpreted as a *path-dependency*. For example, during the COVID-19 pandemic, the use of CollabU became pervasive for teaching and learning, but not for content and assessment management. Academics lobbied for the adoption of CollabU for teaching and learning in full capacity, beyond the collaborative aspects, due to its flexibility and ease of use, hence trying to evade the formal learning management system at the time. However, the official university directive was to keep to its policies, which mandated the use of the formal learning management systems for the management of curriculum and assessments. Indeed, path-dependencies have been recognised as the culprits for influencing, delaying and at times preventing the selection, adoption and use of digital technologies (Rolland et al. 2018). Internal factors such as governance and architecture choices can either enable or constrain the agents' interaction and hence the degree of adaptation to the environment (Sandberg et al. 2020).

Constraints can also be hindrances from the exogenous environment impeding DT through platformisation. I theorise this concept by proposing a new property of *inverse requisite variety* to the kernel theory of coevolution. Inverse requisite variety arises when the need for change

in the internal environment exceeds that of the available variation in the external environment. For instance, on platform Alpha some legacy applications and systems remain because there are currently no adequate market alternatives to replace them. In the words of the Head of Platforms:

> *"In other words, I want to pick platforms and vendors who are going to continually build their product in a way that opens it up to everybody. It's not always possible, so [existing internal system], I don't think there's one like that, so that makes it very difficult. That's just the classic example. It's a little bit more niche. The market is not that strong so therefore you've got to take a different approach."*

This property therefore acts as a damping mechanism (McKelvey 2002). It can slow down or stall DT through platformisation efforts.

Once set into motion, DT through platformisation unfolds as a coevolutionary process between two levels in the organisation (*strategic* and the d*igital platform levels*) through their reciprocal interactions. Such a view recognises that DT unfolds through both top-down and bottom-up driven change. While the top-down (strategic to digital platform) change is often considered deliberate, and the opposite, bottom-up (digital platform to strategic) as emergent (Vessey and Ward 2013), this was not observed as a general rule in the empirical data. When empowered, the lower levels of the echelon (at the digital platform level) can drive deliberate strategic change. An example of this was the formation of a governance body being driven by the TransformationHub (sitting at the digital platform level, but influencing strategic decisions), in case Alpha. Similarly, not all change driven from the strategic level is deliberate, but emerges as a result of shifts in the macro environment. This was exemplified by the extreme contexts, putting pressure on the strategic level to come up with emergent forms of strategising. The coevolution driving DT through platformisation transpires through a number of mechanisms between these two levels (elaborated on in section 6.2).

Extreme contexts can *accelerate* DT through platformisation, inducing *path-alteration.* Extreme contexts call for extreme measures, circumventing previously path-dependent decisions in favour of improvisation and the creation of new pathways. This is exemplified by CollabU's purpose shifting from a collaboration module to being used for teaching and learning purposes as well. Improvisation allows organisations "to spontaneously reconfigure existing resources to build new operational capabilities to address urgent, unpredictable, and novel environmental situations" (Pavlou and El Sawy 2010 p. 443).

This theoretical model builds on Hanelt's et.al (2020) proposed framework for DT, including the conditions, mechanisms and outcomes that lead to change. Unlike Hanelt et.al (2020), I divide the triggers and conditions into separate categories, as they both have different roles in the DT through platformisation process. My theorisation also extends their proposed framework by offering a more elaborate view of DT through a multilevel representation of this phenomenon. Coevolutionary change is complex and occurs in embedded contexts, through multilevel effects (Benbya and McKelvey 2006a). In line with the guiding underlying philosophical paradigm of this study, no attempts have been made to determine the causality of the mechanism through generalised laws. The associations between the mechanisms and the outcomes strive to uncover teleological explanations, rather than causal rules (Gregor 2006). This complex web of interrelated processes is largely adaptive and unpredictable. It can therefore not be deemed as causal or deterministic in nature (McKelvey 2002).

The organisational outcomes of DT through platformisation are continually evolving due to the generative nature of digital platforms. Hence the observed outcomes can be regarded as

snapshots in time (Urbinati et al. 2021). I contend that the nature of the outcomes is dynamic and layered — that is they are continually evolving and producing other flow-on outcomes (e.g. from a B2B to B2B2C model). This is in line with prior theorisations adopting complexity science. As the digital platforms evolve in a generative way, the outcomes cannot be explained by "analysing static configurations of its social and technical elements" (Sandberg et al. 2020 p.142).

The outcomes generated by DT through platformisation can be strategic (i.e. *business model transformation*), operational (i.e. *operational efficiency*), or both (i.e. *organisational resilience*) as observed during extreme contexts. A business model is responsible for how an organisation creates and captures value (Chesbrough 2007). Operational efficiency here denotes the optimisation of internal operations. Organisational resilience is described as " the ability of systems to cope with external shocks and trends" and is critical for an organisation's survival (Heeks and Ospina 2018 p.71).

The ability of DT through platformisation to generate both strategic and operational outcomes for the organisation, generates a higher-order capability of *ambidexterity*. Ambidexterity is the ability of an organisation to engage in both exploitation (optimising operational efficiency) and exploration (strategic pursuits) simultaneously (Vidgen and Wang 2009). Ambidexterity is increasingly recognised as a crucial capability in helping organisations sustain themselves in the digital age (Sia et al. 2021). This is based on the coevolutionary principle of *synchronisation of exploration and exploitation* (Vidgen and Wang 2009).

In this section, I described the proposed theoretical model of DT through platformisation, encompassing a more holistic view, espousing the macro and micro elements. To that end, I demonstrate the relationship between the organisation and the macro environment. In the next section, I delve deeper into the micro-level, unpacking the mechanisms of DT through platformisation.

6.2 Mechanisms of DT through Platformisation

In this section, I present the mechanisms of DT through platformisation, theorised using the lens of coevolution theory. I classified these mechanisms into eight higher-level categories, informed by the literature, or my own interpretation, as recommended by Eisenhardt (1989a). Recognising that some mechanisms occurred in more stable contexts, as opposed to those that occurred in extreme contexts, the mechanisms were further split into these two groups. The mechanisms in stable contexts have been further organised into Strategy-centric and Digital platform-centric mechanisms. The mechanisms in the Extreme contexts are a hybrid of the two. Strategy-centric mechanisms in stable contexts include Strategising, Digital Organising Logic and Innovation mechanisms. The Digital platform-centric mechanisms include Digital Platform Architecture, Digital Platform Design and Digital Platform Development mechanisms. The two categories in Extreme contexts include Improvisational and Experimental mechanisms. This makes up the framework depicted in Figure 8.

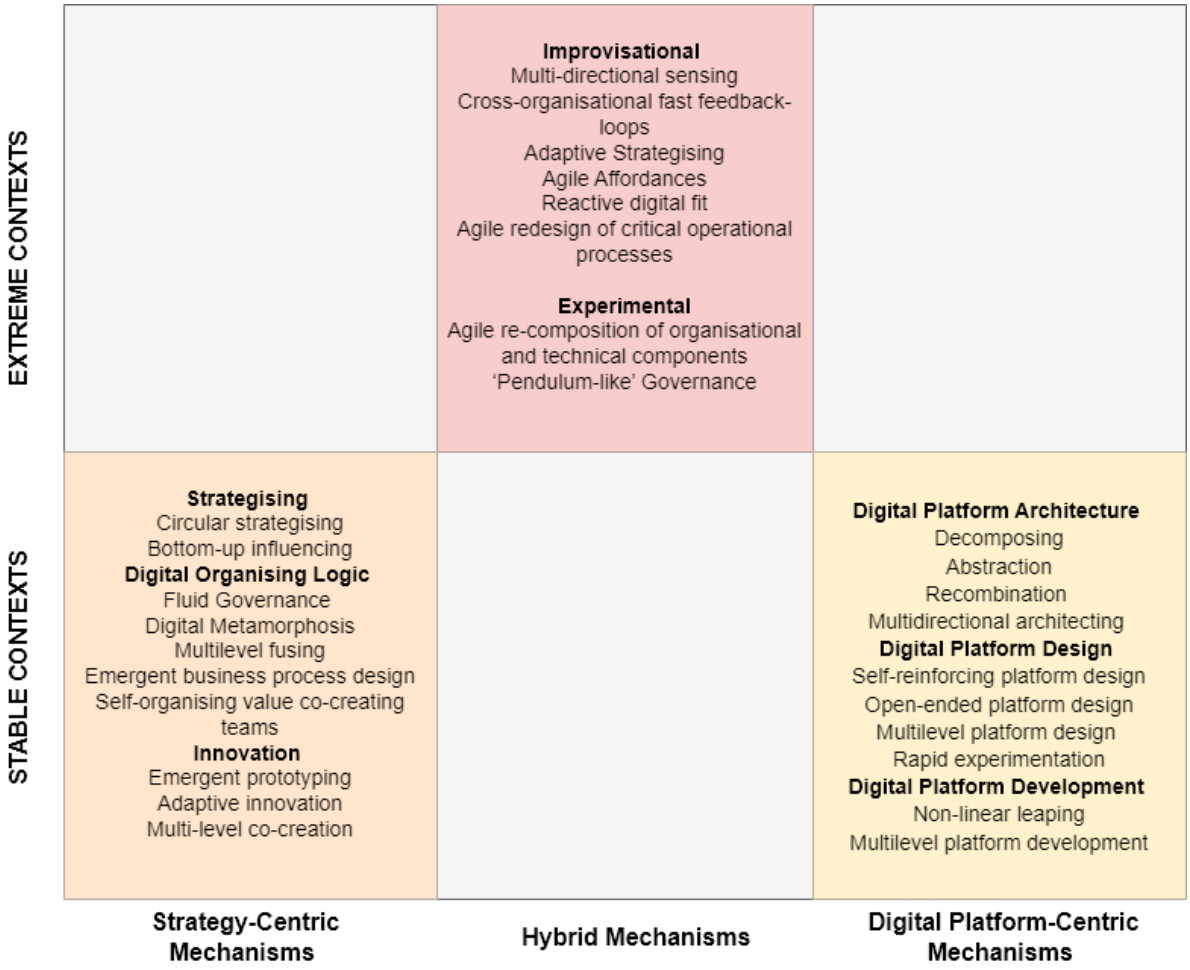

Figure 8 — Theoretical Framework for DT through Platformisation

6.2.1 Mechanisms in Stable Contexts

Inspired by Snowden and Boone's (2007) Cynefin framework I recognise Stable contexts as simple or complicated. In simple conditions, cause and effect is easy to establish, resulting in predictability. Cause and effect in complicated conditions is equally discernible, although not to all involved. In this thesis, stable contexts mark normal conditions, unaffected by the COVID-19 pandemic. I now look at two main categories of mechanisms within stable contexts; strategy-centric and digital-platform centric mechanisms.

6.2.1.1 Strategy-Centric Mechanisms

- **Strategising Mechanisms**

Informed by *strategy as a process* IS literature stream, this category of mechanisms is conceptualised as an ongoing process of *strategising,* placing the emphasis on the active perception of strategy (Whittington 2014), as opposed to a static state. Strategy as a process concept is focused on the changes over time as a result of a sequence of events (Pettigrew 1992).This view holds that realised strategy is a result of both deliberate endeavours and emergence (Mintzberg 1987; Henfridsson and Lind 2014). Moreover, the perceived incongruity between the contents of strategy and its process is counterintuitive, as they are both required for a holistic conception of strategy (Burgelman et al. 2018). This is reflected in

the two mechanisms below — *circular strategising and bottom-up influencing,* which in tandem demonstrate the deliberate and emergent nature of strategy, including a confluence of content and process over time, between the strategic and the digital platform levels in the organisation, in relation to DT through platformisation.

Circular Strategising

This mechanism was observed as both a top-down (deliberate) and bottom-up driven (emergent) process of strategising. I recognise this as a process that it *multi-directional*, *multilevel* and a *positive feedback loop*-like pattern, where entities mutually shape one another. For example, in case Alpha a crowdsourcing initiative invited external influences into the formulation of a new organisational strategy. The organisational strategy drove the formulation of IT and individual unit strategies with multiple nested strategies under each level (e.g. cloud strategy under IT strategy) illustrating a top-down cascading effect. On the other hand, the need for secure communication with external parties drove the acquisition of CollabU, an example of bottom-up driven change.

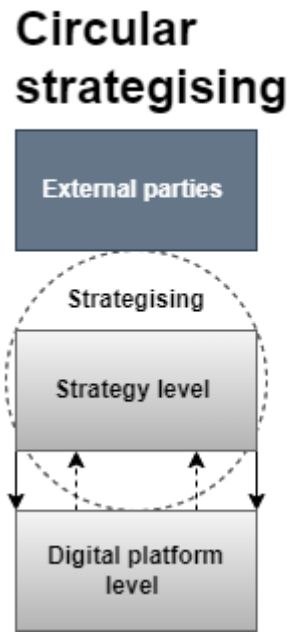

Figure 9 — Circular Strategising Mechanism

In the past decades the IS literature has deviated from the perception of strategy as a static state to one that is a dynamic process (Pettigrew 1992). This dynamic process is often described as *strategising*, emphasising the active form of strategy-making (Henfridsson and Lind 2014; Peppard et al. 2014). Scholars have argued that finding the right balance is required between top-down, formal strategy formulation and bottom-up, emergent approaches. Excessive upfront planning can restrict flexibility in strategising. On the other hand, not enough planning can end up too ambiguous (Marabelli and Galliers 2017)**.** In contrast, the circular strategising mechanism, discovered in this research proposes that strategising is a continual circling between the top-down and bottom-up activities. This is consistent with the concept of "circular organising" denoting an irregular oscillation between the top-down and bottom-up action. This way of thinking acknowledges "these two modes of coordination are not seen as in dichotomous stasis, but rather in dynamic oscillation" (Thomas et al. 2005 p.12)**.**

In the recent years, we have witnessed a growing democratisation of the strategy process, departing from the notion that it is reserved for the upper echelon of the organisation. The concept of open strategy emerged, involving multiple internal and external parties in the strategising process to bring about greater creativity and faster decision-making (Tavakoli et al. 2017). Particularly, engaging external parties in the strategising process in the form of crowdsourcing is equally beneficial for established organisations, as it is for start-ups, in order to spur innovation (Schlagwein and Bjørn-Andersen 2014). This has also been found at AU-U where multiple perspectives helped to produce a unified vision for DT through platformisation that could be later split into more granular strategies.

Bottom-up Influencing

I observed this mechanism as the influencing of higher-level agents by lower-level agents, which enabled the digital platform to evolve by investing in a new module. I recognise this as a *multilevel* and *multi-directional* mechanism. For example, on platform Alpha, the influencing of the middle management at the digital platform level, led to the acquisition of a new customer relationship management (CRM) module by influencing the senior management.

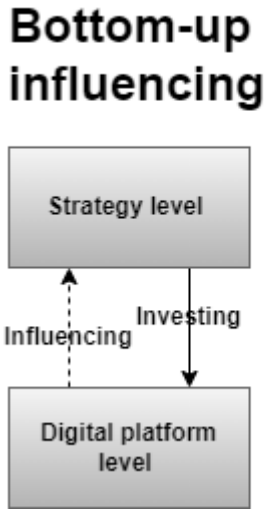

Figure 10 — Bottom-up Influencing Mechanism

Indeed, pressure that arises between different areas in an organisation can be beneficial, as it helps drive its evolution (Allen and Varga 2006). In the context of IS development, bottom-up influencing of the lower level agents can result in new structures and processes during IS development (Benbya and McKelvey 2006a). Therefore, empowering operational managers can help to drive coevolution of strategic initiatives, as these managers are more apt at recognising new opportunities, due to possessing a greater awareness of the operational processes and routines (Volberda and Lewin 2003). Middle managers through their own interpretations of the environment, instantiate new projects that may eventually become organisational strategic initiatives — a characteristic of *genetic fixing* (Floyd and Wooldridge 1997; Porter 2016). The same was observed at AU-U. The ability of the middle management to influence the senior management who did not initially see the value of the CRM module for the university context, facilitated further coevolution of platform Alpha.

I conclude this section with the following proposition:

P1. DT through platformisation requires dynamic and democratised forms of strategising, engaging multiple levels of the organisation, through formal and informal processes.

- **Digital organising logic mechanisms**

This category of mechanisms has been labelled *digital organising logic* to emphasise the changing organising logic, as a result of DT through platformisation. In the past, organising logic has been described "as the managerial rationale for designing and evolving specific organisational arrangements in response to an enterprise's environmental and strategic imperatives" (Sambamurthy and Zmud 2000 p.107). However, the view taken in this study is that organising logic in the digital age is equally a result of emergence (Benbya et al. 2020), hence broadening the aforementioned definition. Digital organising logic in that sense are the patterns of action conducive to the realisation of organisational goals (Pentland et al. 2021). The mechanisms in this category are self-organising governance, digital metamorphosis, multilevel fusing, emergent process design and self-organising value co-creating teams.

Self-Organising Governance

This mechanism was observed as both spontaneous and deliberate organisation into new governance structures. As such, it is recognised as a *multilevel*, *self-organising* and *emergent* mechanism. The emergent governance structure can become reified into a formal governance structure. For example, in case Alpha, a spontaneous, emergent governance structure emerged to lead the DT through platformisation efforts. At the same time a new governance structure was being designed by the TransformationHub, which would become reified into a formal governance structure.

The novel governance structure can engage in *multidirectional* influencing with governance structures above its level in the organisation. For example, in case Alpha, an interim governance board emerged consisting of the key stakeholders in the organisation to oversee the progress of DT efforts. This group in turn informed the higher-level DT board responsible for the direction of the overall digital platform. Hence, the emergent governance group at the digital platform level, responsible for introducing new modules into the new digital platform informed the higher-level governance board at the strategic level and vice-versa.

Figure 11 — Self-Organising Governance Mechanism

Concurring with prior theorising, self-organising processes between autonomous, heterogeneous agents lead to emergent structures, including new social structures and new organisational levels (Thomas et al. 2005). In case Alpha, new social structures emerged (governance bodies), but also a new organisational level (formalised governance board connecting the digital platform level and the strategic level). Although these structures can be seen as a result of emergence, an observation can also be made that their reification into a formal governance model is eventually required through deliberate action.

Prior literature has suggested digital platforms within an organisation rely on centralised governance structures, as opposed to digital infrastructures which rely on more democratised structures (Hanseth and Lyytinen 2010; Törmer 2018 b). The self-organising governance mechanism suggests this may not always be the case, implying governance structures around a digital platform can form in emergent ways. Platform governance as a guiding paradigm has been proposed for some time as a more flexible way of organising (Sambamurthy and Zmud 2000). Ecosystem governance has been studied extensively over the years, mostly focusing on the relationship between third-party complementors and the platform owner. A common theme in this stream of literature is the trade-off between generativity and control to ensure quality of the digital platform modules (Huber et al. 2017). However, this stream largely ignores internal dynamics of digital platforms. Prior studies have addressed how loosening governance structures can lead to greater innovation potential (Gregory et al. 2018; Schreieck et al. 2022). In these studies, governance changes are the antecedent to innovation. Yet, they do not address the type of governance structures that arise as a result of platformisation — that is the type of governance required to manage emerging digital platforms in established organisations. This mechanism sheds light on the *how* of governance pertaining to decision entitlements and formal and informal governance mechanisms — see (Tiwana et al. 2013).

Digital Metamorphosis

This mechanism was observed as a transformation of socio-technical components from one state into another, leading to a conception of a digital platform. I interpret this mechanism as occurring through *adaptive tensions* between the strategic and the digital platform levels. For example, for platform Alpha, the decision to transfer all AU-U offerings onto the newly procured HighEd M and decommission the learning management legacy system was driven by the adaptive tension from the strategic level to optimise costs leading up to the end of the licensing agreement for the legacy system. In addition to the technical aspects, a new department sprang up (TransformationHub) to oversee the DT efforts. The High-Ed M module through the TransformationHub inspired a broader change at the university to redesign its curriculum and the student experience.

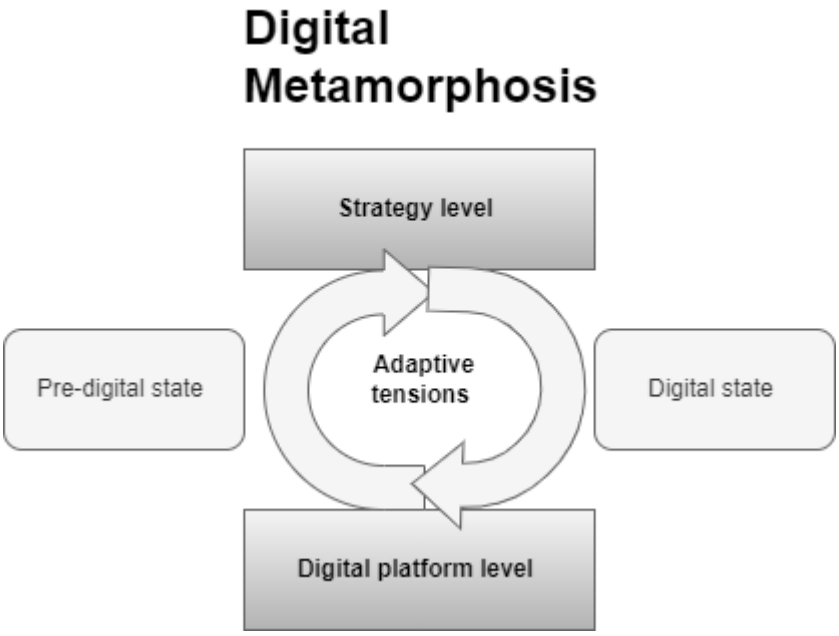

Figure 12 — Digital Metamorphosis

Consistent with prior literature, generativity spurred by the digital platform results in a phase transition or a new organising logic (Sandberg et al. 2020). Phase transitions brought on by adaptive tensions can lead to emergent outcomes (Benbya et al. 2020). Adaptive tensions do not just generate alignment as a one off-event, but set the coevolution process into motion, "as a dynamic interplay of coevolving interactions, mechanisms and effects" (Benbya and McKelvey 2006b p.209). The imposing tensions from the external environment drive the organisation to raise the diversity of their internal resources to meet the requisite variety imposed from the external environment (Schmid et al. 2021). Adaptive tensions also arise internally, as the entities impose pressure on one another, leading to a build-up of tension, which seeks an adaptive response (Vidgen and Wang 2009; Montealegre et al. 2014).
Adaptive tensions are different to paradoxical tensions previously discussed in the context of DT (Wimelius et al. 2020). While paradoxical tensions cannot be resolved and therefore need to be managed (Rolland et al. 2018; Wimelius et al. 2020), adaptive tensions are the mechanism for causing change when a certain threshold is reached (McKelvey 2002).
This was observed at AU-U, where the external environment exerted pressure for a revamp of the postgraduate strategy by acquiring a new digital platform. Subsequently, internal adaptive pressures ensued, as it became too costly to run both the legacy learning system and the digital platform in parallel.

Multilevel fusing

This mechanism was observed as the fusion of two entities in the organisation into a new entity with common goals around the digital platform. For instance, in case Alpha a fusion between the business and IT functions into a unified function was observed through TransformationHub, resulting in a new level, as a new way of organising around the digital platform. The *emergence* of new forms is a consequence of coevolutionary dynamics, yet often observed at the macro and meso levels (Koza and Lewin 1998; Lewin et al. 1999), rather than the micro-level. While the literature has often discussed the establishment of multidisciplinary, dedicated units for digital innovation (Svahn 2017), the example of case Alpha shows that not only is this true for DT through platformisation, but the role of the TransformationHub went beyond the DT program itself to influence the adoption of modules and enforce new practices across the organisation.

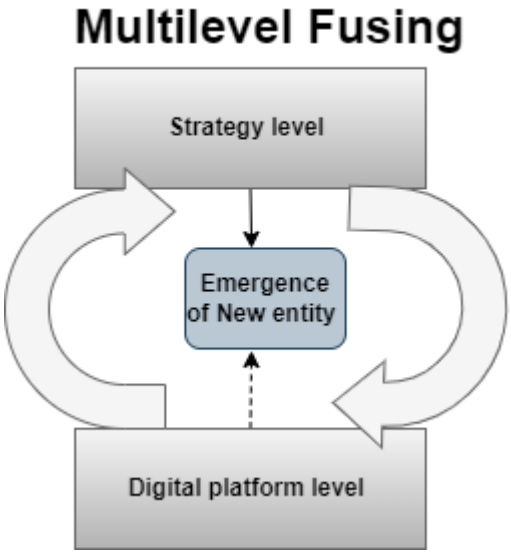

Figure 13 — Multilevel fusing mechanism

Although business and IT as coevolving entities reciprocally influence one another over time, as stipulated by coevolution theory (Peppard and Breu 2003; Benbya and McKelvey 2006b), through these interactions they are also able to produce new forms, exhibiting the characteristics of both entities. Scholars are recognising the importance of elevating the status of IT in organisations to one where technology does not play an auxiliary, but rather a central role in achieving business goals, and as such becomes deeply entrenched in the organisational strategy (Bharadwaj et al. 2013a; Sia et al. 2021).

Emergent business process design

This mechanism relates to the emergence of new business processes being driven as both a requirement for the new digital platform, but also as an unforeseen outcome of the digital platform. The mechanism relates to the coevolution properties of *emergence* (of new and unanticipated business processes) and *multilevel effects* (through the engagement of various parties at different levels in the organisation). For example on platform Beta, the need to introduce new business processes emerged to support the new features of the digital platform (such as the digital concierge). The emergent functionality triggered multilevel engagements at the strategic level to introduce new processes. On platform Alpha, the need to improve student feedback, was identified through surveys at the strategic level, which led to an automated feedback feature on the digital platform.

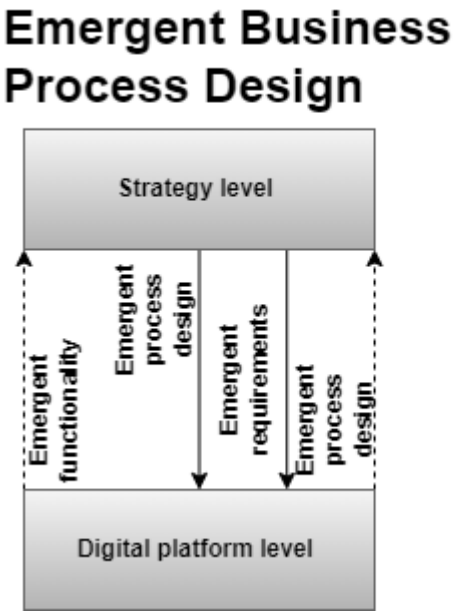

Figure 14 — Emergent business process design

In the context of DT, designing new processes is a complex endeavour due to the simultaneous drawing of affordances from multiple digital platforms. This is a stark contrast to designing processes with the past generation of IT systems, such as ERP systems, drawing data from a single source. The processes are not predetermined, but often emerge through learning and new ways of doing business, and often have a flow-on effect to other interrelated processes (Baiyere et al. 2020)**.** This was also observed in case Beta, as new features emerged (such as digital concierge and feedback module) prompting new business processes to be designed to support them. Moreover, introducing new functionality (e.g. emergent identity management taxonomy) had a flow-on effect on university-level identity management efforts, causing new processes to emerge. In such scenarios, the digital technology takes centre stage in driving the emergence of new processes. For example Bygstad and Øvrelid (2020) found that the implementation of lightweight IT digital technologies in a hospital context informed the redesign of existing processes supported by legacy systems.

Self-organising, value co-creating teams

This mechanism is recognised as the unprompted organisation of heterogeneous agents (technical and social) to adapt to their environment and evolve the digital platform. This is recognised as a *self-organising* mechanism. For example, in case Gamma, at the strategic level a new committee sprang up of diverse stakeholders to drive strategic efforts. At the same time, a new team was set up by hiring externally, that was empowered to co-create new products for the platform with different parties at the university and continued to influence the strategy from the digital platform level by continuously redesigning existing products and designing new products.

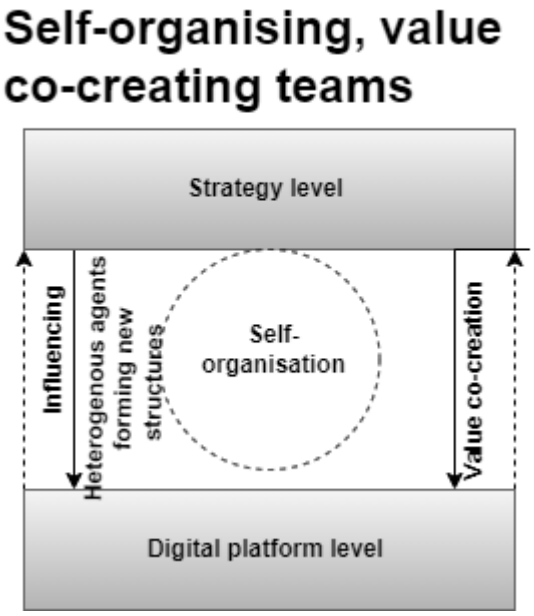

Figure 15 — Self-organising, value co-creating teams mechanism

Prior literature has also found that setting up dedicated cross-functional teams was necessary to drive DT efforts (Svahn 2017; Yeow et al. 2018) by improving communication and collaboration between the different areas of the organisation (Vejseli and Jung 2018). Setting up a dedicated team independent of the core business can help the organisation explore the external environments to drive innovation (Leijon et al. 2017). This was the case with Case Gamma, which deviated from the core business of traditional education and commenced driving the design of micro-credentials at AU-U.

I conclude this section with the following proposition:

P2. DT through platformisation requires more fluid ways of organising teams, organisational and governance structures, including new processes to support the evolution of digital platforms.

- **Innovation Mechanisms**

This category of mechanisms was observed as enabling the organisation to change existing value propositions and introduce new value propositions (e.g. shorter forms of learning and education for the enterprise market). Innovation mechanisms enable an organisation to "coordinate and leverage different types of resources to create and capture value through the adoption and exploitation of digital technologies in the innovation process" (Urbinati et al. 2021 p.1). The mechanisms included in this section are adaptive innovation and multilevel co-creation and emergent prototyping.

Adaptive Innovation

This mechanism was observed as fostering of ongoing innovation to meet environmental demands. I recognise this as a need to achieve *requisite variety* in light of environmental shifts, leading to *genetic fixing* of a new digital platform into the organisation's DNA, as well the introduction of new value propositions. For example, in case Gamma, the changes in the postgraduate market impelled the university to forge new value propositions to stay competitive, which led to a permanent change to its business model. At the strategic level, market research was conducted, and a strategy formulated for reimagining postgraduate

education. HighEd M was eventually procured as part of these efforts that would support the new business model. As the dedicated team was set up to drive the innovation process, new requirements for products on the digital platform were identified, which in turn shaped the strategy.

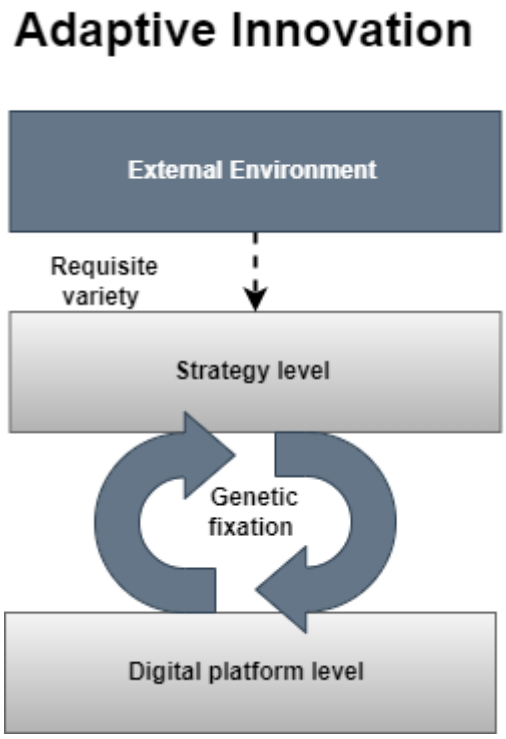

Figure 16 — Adaptive Innovation

The law of requisite variety stipulates the rate of internal change in the organisation needs to match or exceed the external environmental rate for an organisation to remain viable (McKelvey 2002; Vidgen and Wang 2009; Vessey and Ward 2013). The concept of genetic fixation and replication in coevolving entities cements the change as permanent (Porter 2016). In the example above, AU-U adapted to market shifts by redesigning its strategy. Moreover, emergent requirements for new products emerged at the digital platform level, which in turn influenced the strategy. Both levels caused the *genetic fixation* by introducing new permanent change in the form of a new business model, as well as additional new products.

Multilevel Co-creation

This mechanism was observed as the co-creation of value between parties internal and external to the organisation. I recognise that value was created as a result of *multilevel* interactions, resulting in *emergent* value propositions. For example, in case Gamma, co-creation of value between external client organisations and internal AU-U stakeholders resulted in new products for the new enterprise market on platform Gamma, but also open to the general public. The collaboration unfolded through platform Alpha's modules and the value was delivered on platform Gamma. Similarly, the initial creation of micro-credential products for platform Gamma transpired as a co-creation effort between the newly appointment Innovation unit and the faculties. The collaboration was enabled by the modules at the digital platform level (e.g. CollabU).

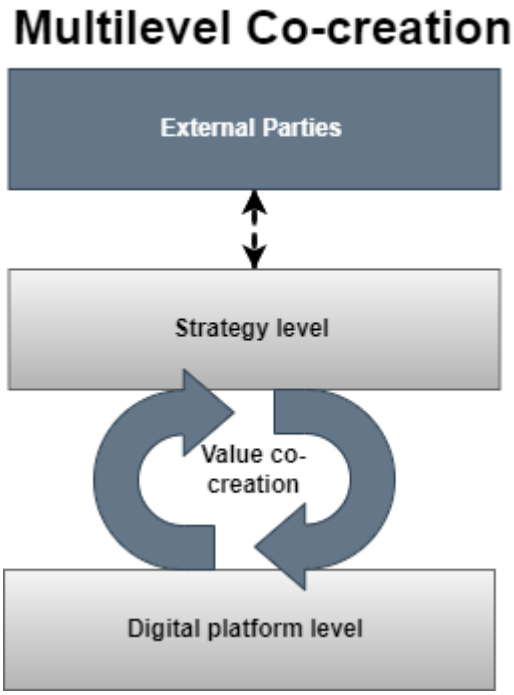

Figure 17 — Multilevel Co-creation mechanism

In line with prior research, expanding opportunities by engaging with external partners for value creation helps organisations materialise on DT and challenge the status quo (Svahn 2017). Moreover, cloud based SaaS collaborations platforms allow processes to transcend organisational boundaries and integrate internal and external processes (Battleson et al. 2017). This was also the case with AU-U where the flexibility of its platforms enabled the co-creation with external parties to unfold seamlessly.

Emergent Prototyping

This mechanism relates to the prototyping of digital products on a digital platform before evolving a full-fledged digital platform. This mechanism relates to the properties of *multilevel effects* and *emergence.* For example, in case Gamma, the university recognised the need for alternative value propositions to remain relevant in a highly competitive market. To stand-up the initial version of Platform Gamma the university hired an external consultancy, which set up a pilot through a third-party cloud learning platform. The third-party also developed the initial set of test products. The *multilevel* interactions involved in prototyping included the focal organisation, as well as parties external to the organisation, resulting in the *emergence* of new value propositions.

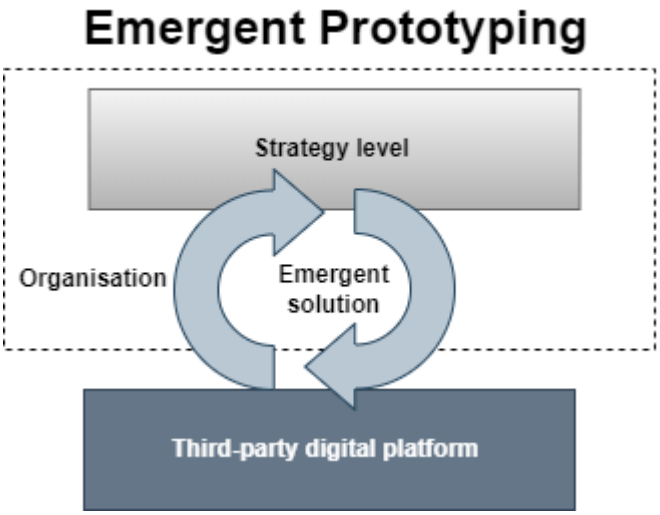

Figure 18 — Emergent Prototyping Mechanism

Consistent with the previously articulated concept of *bootstrapping*, providing initial value can motivate early users to adopt a digital platform, without predetermining the final design or scale (Hanseth and Lyytinen 2010; Grisot et al. 2014). To that end, a bootstrapped digital platform offering limited services can easily expand to include diverse offerings from heterogeneous agents (Bonina et al. 2021). Prototyping can help organisations gain insight into the initial perceptions of a product or digital platform and the opportunities for improvement (Tim et al. 2020). Prototyping can also drive digital platform evolution through reinforcing feedback patterns, whether the organisation is building a digital platform in-house (Montealegre et al. 2014), or engaging with a vendor (Rolland et al. 2018). Similarly, an emergent prototype of platform Gamma emerged through a third-party, while the university was in the process of procuring HighEd M and an e-commerce module for managing the payment of digital courses. The initial prototype was an interim solution while AU-U worked on delivering a full-fledged digital platform.

I conclude this section with the following proposition:

P3. DT through platformisation hinges on continuous innovation to redefine and introduce new value propositions, including boundary-spanning value co-creating with internal and external parties.

6.2.1.2 Digital Platform–Centric Mechanisms

- **Digital Platform Architecture Mechanisms**

This section introduces digital platform architecture mechanisms as a means of achieving DT through platformisation. Platform architecture has been described as a conceptual framework for organising the platform into a modular structure include a core and a set of interrelated modules (Tiwana et al. 2010). One of the defining features of digital platforms is its layered and modular architecture, capable of yielding generative effects — a contrast to the past generation of monolithic systems (Yoo et al. 2010).

Architectural choices can have long-lasting ramifications for organisations (Tiwana et al. 2010). Architecture plays a crucial role in the digital platform's design and evolution (Spagnoletti et al. 2015; Constantinides et al. 2018). To avoid lock-in, platform architecture

needs to accommodate an increasing number of interlinked socio-technical components, and through the actions of loosely governed agents, give it the ability to evolve in unanticipated and unknowable ways (Hanseth and Rodon Modol 2021). The mechanisms in this category are called decomposing, abstraction, recombination and multidirectional architecting.

Decomposition

This mechanism relates to the disintegration of socio-technical components into smaller subparts, giving them greater autonomy over their evolution. It is based on the principle of *decomposition.* For example, Platform Beta was set up on its own instance, separate from the university's main CMS module, giving it greater control and autonomy over its evolutionary path. At the same time, the breakdown of the main IT strategy into domain strategies to support digital platforms, provided the different domains, including Research with more autonomy and accountability over the decisions relating to their digital platforms.

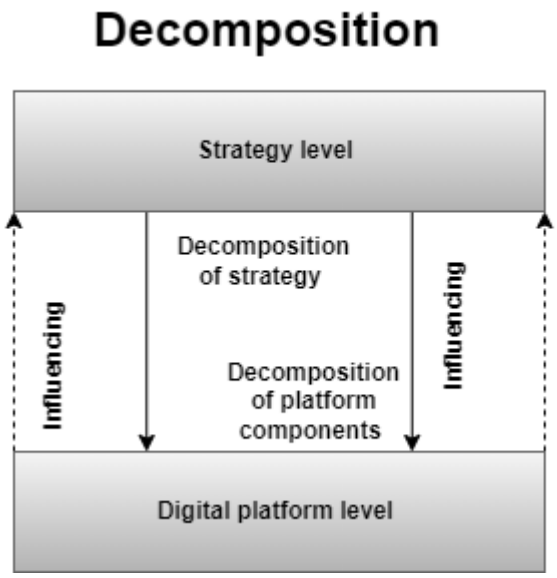

Figure 19 — Decomposition mechanism

The literature highlights the importance of building systems with disassembly in mind, not only integration. Systems that can be easily dissembled — dismantled into sub components without impacting on the rest of the system are considered highly decomposable (Agarwal and Tiwana 2015). Decoupling can be a complicated endeavour in more complex types of organisations (Brunswicker et al. 2019). The same was observed on platform Beta, where an exception needed to be sought to allow the digital platform to deviate from the university's architecture principles. This is also true for social systems, like organisations. Each semi-autonomous part can adapt to local conditions easier and quicker than the whole, therefore increasing the overall adaptability of the whole (Weick 1976). Literature also finds that reorganising around capability platforms integrates the business and IT functions to strengthen their alignment (Sia et al. 2021). At AU-U, the splitting of the IT strategy into domain strategies allowed different organisational units more responsibility over identifying and delivering their digital platform initiatives.

Abstraction

This mechanism relates to building of generic digital platform components that can be easily reused by different parts of the organisation for different purposes or assembled into new

digital platforms. It is based on the principle of *modularity.* For instance, at AU-U, the central Architectural function is in the process of building a catalogue of modules and APIs with generic functionality that can be reused across the organisation. This will enable modules to be configured into new solutions on the digital platform level.

The advantage of architecting digital platforms is the ability to build generic functions that can address the needs of heterogeneous users (Spagnoletti et al. 2015; Hanseth and Rodon Modol 2021). Moreover, building a generic suit of IT capabilities supports re-use by giving different departments in the organisation a way to develop functionalities at greater velocity then previously possible, by abstracting technical components and bringing about services that can be assembled quickly even by non-technical users (Gregory et al. 2018)**.** This also leads to nonlinear effects, due to the inability to preconceive how the modules, as they are designed, will fit into the whole (Yoo 2013).

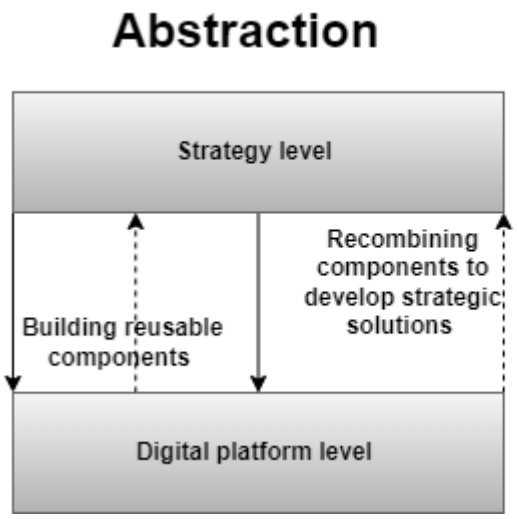

Figure 20 — Abstraction

Recombination

Recombination refers to the ability of the modules to be recombined in different ways to produce new solutions and to serve in different contexts. This mechanism draws on the coevolutionary principle of *modularity*. For example, platform Beta emerged as a new platform by reusing and recombining existing modules in a new context (such as internally developed modules, as well as third-party modules).

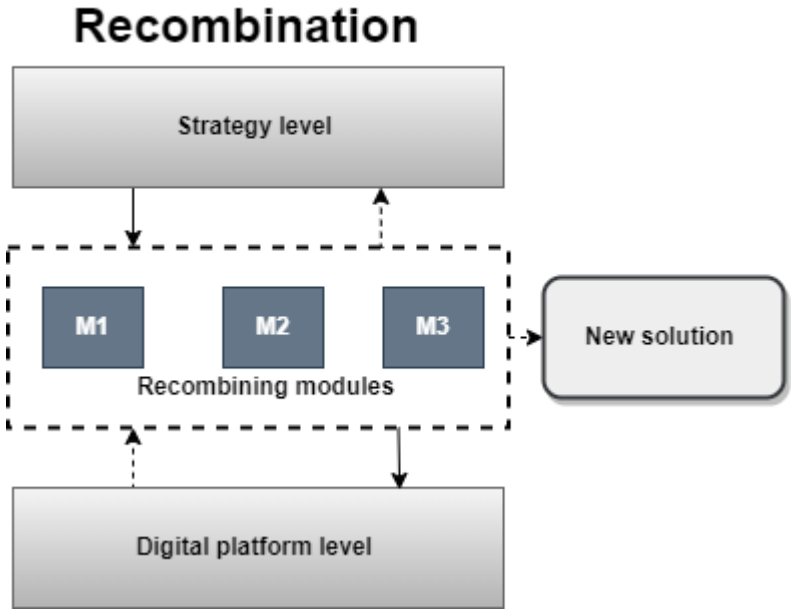

Figure 21 — Recombination mechanism

This mechanism is congruent with prior research finding that the flexibility of modular architectures allows components to be recombined in new ways, paving the way for new services (Henfridsson and Bygstad 2013). The loose coupling of the modules enables a flexible architecture capable of fast adaptation and can help spur new innovations with ease (Yoo et al. 2010; Zhang et al. 2019). The ability of digital technologies to not only generate new affordance, but their ability to be recombined generates new value paths which can be transformative for an organisation (Pentland et al. 2021). This was also observed at platform Gamma, where the new value propositions for the enterprise market emerged through the re-combinations of existing components. Recombining technical components can lead to the recombining of organisational components around the digital platform (Vestues and Rolland 2021). Indeed, platform Beta enabled the emergence of an internal ecosystem by connecting different parties at the university.

Multidirectional architecting

Multidirectional architecting was observed as a mechanism of bottom-up, top-down and cross-organisational architecting of digital platforms. It is based on coevolutionary *multidirectional effects*. An example of a bottom-up and top-down architecting in platform Beta was a personalisation module being developed for the digital platform, which ended up influencing a higher, organisational level module for strengthening identity management. Once finalised the changes will in turn reflect on Platform Beta. Consulting platform Gamma for input on platform Beta is an example of cross-organisational influences.

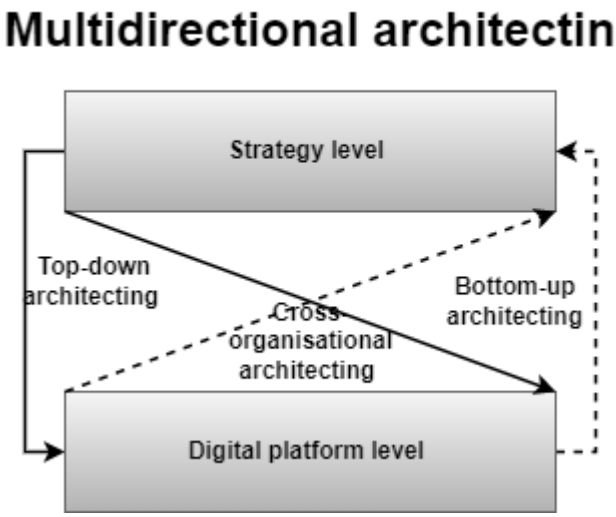

Figure 22 — Multidirectional Architecting Mechanism

The *multilevel architecting* mechanism demonstrates that architecting digital platforms is a part of a much larger process that is both emergent and deliberate, bottom-up and top-down, as well as cross-organisational. This extends our understanding of digital platforms as being under centralised architectural control (Hanseth and Lyytinen 2010). While the centralised architectural function is still present at AU-U, a dismantling across the organisation is occurring into a more democratic platform model, where each division has more control over its own digital platforms. This is consistent with recent research finding that modularising monolithic structures is a way to achieve DT through platformisation (Bygstad 2020; Vestues and Rolland 2021).

I conclude this section with the following propositions:

P4. Architecting digital platforms requires a democratic approach, giving an organisational domain more autonomy over its digital platforms, whilst being federated by a centralised architectural function.

P5. Architecting digital platforms requires the ability to integrate, disintegrate and recombine components, according to the rules of modularity.

- ## Digital platform design mechanisms

This category of mechanisms enables the emergence and evolution of digital platforms through design. Design involves constructing a new artefact and involves both the process of design, as well as the final product (Tura et al. 2017). Design is the “practice of inventing, creating, and implementing (technical) artefacts that depends upon, integrates, and transforms heterogeneous and uncertain domains of knowledge” (Mark et al. 2007 p. 547). Platform design is associated with designing the technical features of the digital platform to meet organisational goals. Digital platform design accommodates heterogeneous users and enables the digital platform to grow through the introduction of new features (Spagnoletti et al. 2015). These mechanisms are self-reinforcing platform design, open platform design, multilevel platform design and rapid experimentation.

Self-reinforcing platform design

Self-reinforcing platform design was observed as a user-driven platform design mechanism through an iterative process of feedback, design and implementation. This is recognised as a

positive feedback loop that drives the coevolution of the digital platform. For example, in platform Beta, the feedback collected from the users and other stakeholders through formal and informal avenues informed the strategy and the subsequent iterations of the digital platform. This ongoing feedback loop drove the evolution of the digital platform.

This is consistent with prior findings that the benefits of digital innovation can be yielded from self-reinforcing mechanisms (Drechsler et al. 2020). Self-reinforcing mechanisms have been found to lead to the development of new products and services on digital infrastructures (Henfridsson and Bygstad 2013). However, in contrast, the self-reinforcing platform design mechanism discovered in this thesis takes on an intra-organisational perspective, emphasising the role of feedback from end-users and other communities in the organisation in driving digital platform evolution.

Whilst the majority of the literature has focused on the co-design of products, the co-design of digital platforms is a fundamentally different process, where the users take an active role in designing the technical artefact, as well as the resulting new practices (Islind et al. 2019). At AU-U, platform Beta emerged as not only a new platform, co-designed with stakeholders, but it required the design of new business processes, as well as culture changes (e.g. new ways of working).

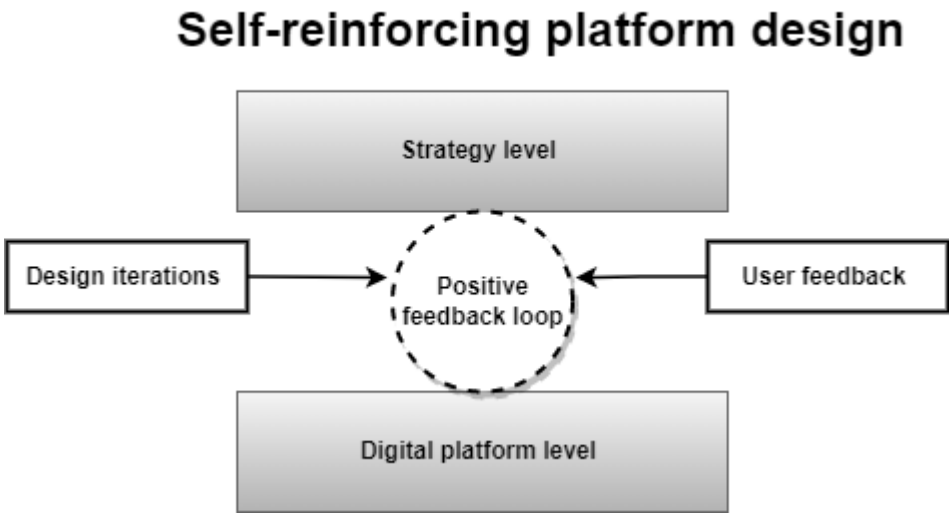

Figure 23 — Self-reinforcing Platform Design

Open-ended platform design

The open-ended platform design mechanism relates to the designing of the digital platform without a definite end-goal in sight, only high-level design principles that guide, but do not dictate the final outcome. This type of designing is *emergent* and *nonlinear* in fashion. For example, in case Beta, the digital platform was initially designed at the strategic level without fully knowing what the problems or the challenges were, continually learning from the process. At the digital platform level, the established partnerships between IT and business allowed for a collaboration, and discussion of potential solutions in an open forum.

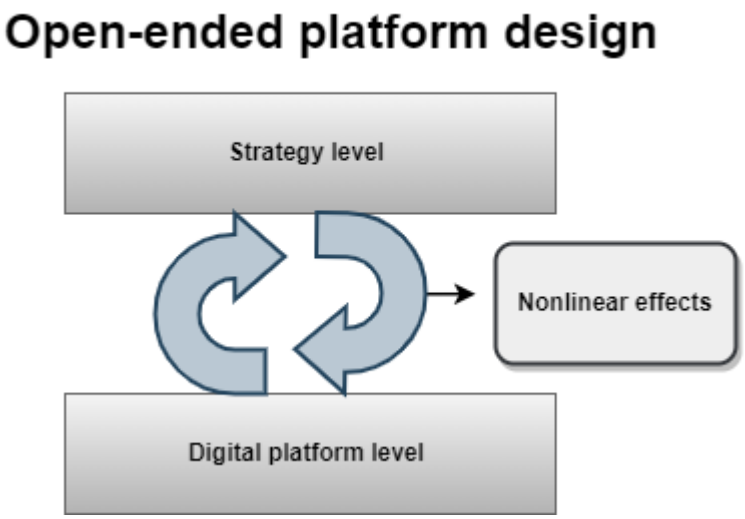

Figure 24 — Open-ended platform design

From the literature we know that complex socio-technical systems, like digital platforms are inherently open systems with fluid boundaries (Allen and Varga 2006; Benbya et al. 2020). In that vein, platform design is dynamic and leads to nonlinear effects (Han and McKelvey 2008), as heterogeneous agents (both social and technical) respond to each other and factors in their internal and external environment. Such systems manifest in unpredictable outcomes and contexts, as they are perpetually evolving. To that end, they cannot be understood as a sum of parts (Hanseth and Lyytinen 2010; Yoo 2013; Benbya et al. 2020). Due to its open nature, the heterogeneity of socio-technical components increases over time, in turn increasing the complexity of the system (Hanseth and Lyytinen 2010). These unconstrained exchanges between heterogeneous actors and technical components give rise to generativity of the digital platform (Yoo 2013). Similarly, platform Beta was built to evolve, initially starting with only limited functionality, but with a vision of growing into a digital platform providing value for both internal and external stakeholders.

Multilevel platform design

This mechanism was observed as digital platform design, spanning hierarchical levels and populations in the organisation and outside the organisation. I recognise this mechanism as both *multilevel and multidirectional.* For example, at platform Beta both internal stakeholders and external parties (other universities and an external consultant) influenced the design process, spanning multiple levels. The design was a combination of top-down high-level design principles, bottom-up emergent features, as well as diagonal or cross-organisational input, involving multiple organisational units such as the faculties and the library.

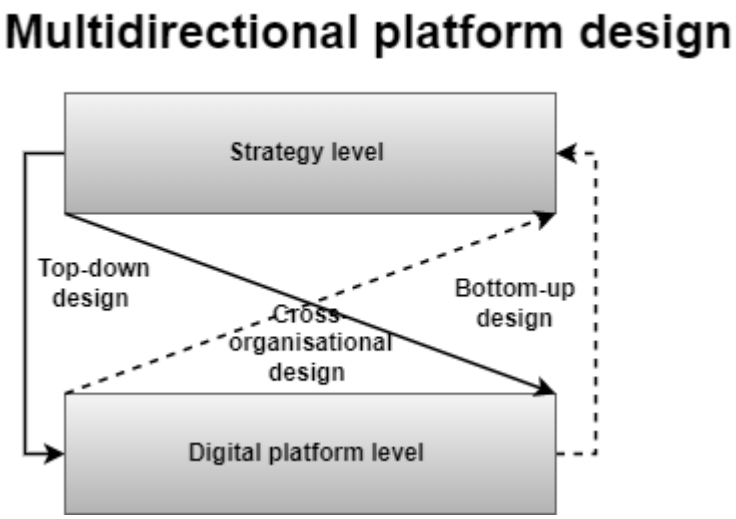

Figure 25 — Multilevel platform design

Although design thinking has made its way into organisational science to promote design by individuals who are not trained designers and engender co-creation between stakeholders (Björklund et al. 2020), there have not been many studies addressing how this transpires for digital platforms in organisational contexts. Considering digital platforms in online communities (Spagnoletti et al. 2015) has not been able to address this challenge, since digital platforms in formal organisations are subject to greater control.

The process of platform design in incumbent organisations is encumbered with competing goals and agendas, which add to the complexity of the process, requiring boundary objects as tools for negotiation (Islind et al. 2019). Similarly, at AU-U the participants engaged in Lego Serious Play (LSP), where they built Lego models and justified them with narratives. This was deemed an effective method for articulating the vision for the platform. LSP is a useful method for improving communication in a workshop setting by allowing the participants to express themselves more freely. It can be an effective strategic tool for developing a vision statement (Grienitz et al. 2013).

The importance of cross-functional teams in platform design has also been observed in the automotive industry. Standing up an innovation hub for stakeholders from different areas of the organisation to collaborate and innovate can be an effective method for evolving the digital platform (Svahn 2017). Similarly, platform Beta had a dedicated cross-functional team, enabling new ideas to be reviewed in an ongoing fashion.

Rapid experimentation

Rapid experimentation was observed as a mechanism that drove the design of novelty on the digital platform. I recognise this as a process of *emergence.* Enabling this mechanism was contingent on a culture change within the organisation to one of less rigidity and more exploration. I recognise this as *adaptive tensions* between heterogeneous actors. We can see evidence of this in case Beta, where the strategic level encouraged experimentation and a fast implementation of new ideas, despite initial resistance, due to new ways of working. This led to the emergence of weekly design jams where ideas could be brought up and implemented swiftly on the digital platform.

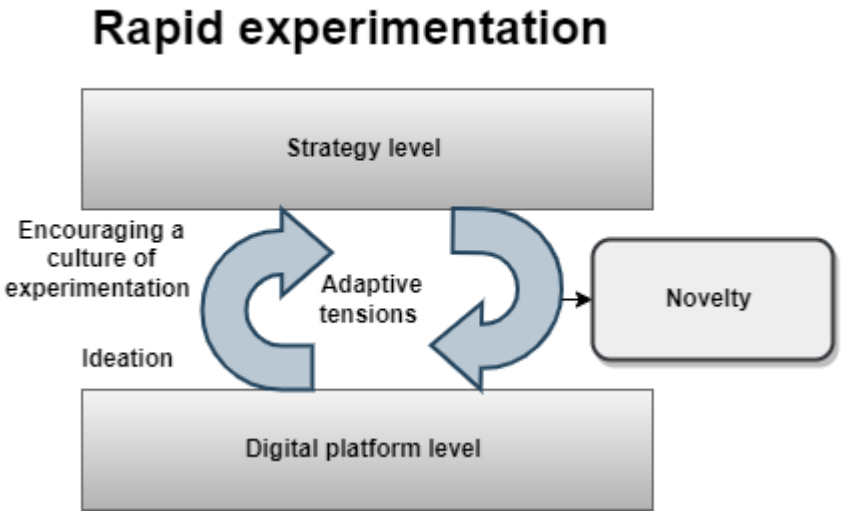

Figure 26 — Rapid Experimentation Mechanism

Concurring with the literature, adaptive tensions set in motion the coevolving interactions that drive the evolution of the system (Benbya and McKelvey 2006b). In Case Beta, ongoing adaptive tensions arise that needed to be resolved in order for the digital platform to evolve. The culture of experimentation was met with resistance that needed to be overcome to progress.

As heterogeneous agents interact through a dynamic and evolving process, novelty emerges in the form of new arrangements or structures (Benbya et al. 2020). The dynamic nature of change in today's organisations gives rise to ongoing speedy experimentation, in favour of upfront planning for new digitised processes and products (Hanelt et al. 2020). Experimentation can be an effective way for a new digital platform to quickly evolve (Hanseth and Lyytinen 2010). This was also witnessed on platform Beta with new features identified, prioritised and implemented quickly.

I conclude this section with the following propositions:

P6. Digital platform design for DT through platformisation is an ongoing process of feedback and implementation between multiple parties, both internal and external parties, without predefining an end-goal, but contending that priorities are continually shifting.

P7. Digital platform design for DT through platformisation requires culture changes to support exploration and experimentation.

- **Digital Platform Development Mechanisms**

This category of mechanism relates to the development of digital platforms as part of the DT process. Platform development refers to the building of new features, as well as reconfiguring existing modules to achieve different outcomes. Platform development can be used for the purpose of expanding platform value for internal and external stakeholders (Jovanovic et al. 2022).

Nonlinear Leaping

This mechanism was observed as a flexible development and implementation of digital platform functionality, receptive of unforeseen changes. It is based on the coevolution properties of *nonlinearity* and *modularity.* The digital platform's modular design and

generativity can give it the required flexibility to easily adapt to unforeseen changes and evolve in unanticipated ways. For example, in case Alpha, the move to HighEd M unfolded in unanticipated ways, as the users started using the new digital platform. New requirements were triggered at the strategic level that were unforeseen at inception, which drove the digital platform to be extended through third-party modules. At the same time, unforeseen challenges at the digital platform level during the implementation influenced a change in the strategic direction.

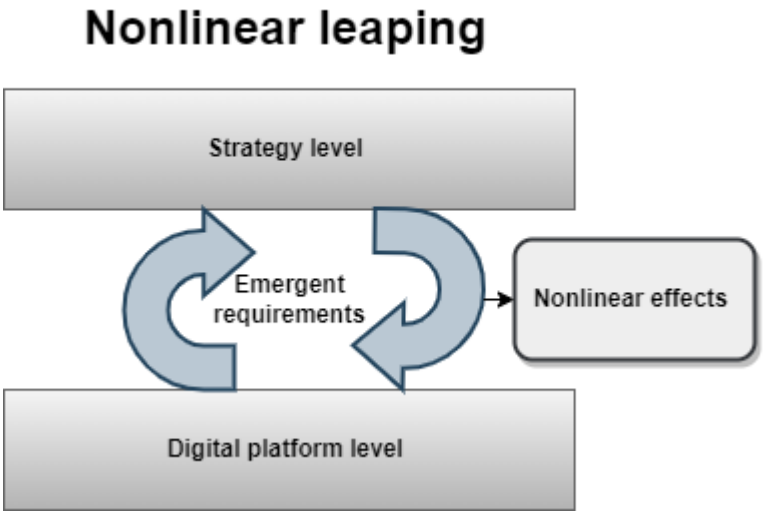

Figure 27 — Nonlinear Leaping Mechanism

The nonlinear nature of IS has been recognised for some time. Goals even when defined upfront evolve in unpredictable ways, through changes and continual improvements over time. Therefore IS does not just coevolve with its interdependent parts, but also goes through recursive adaptation cycles. Nonlinear systems are unpredictable and evolve towards unknown and unknowable states through local interactions between technical components and human agents (Benbya and McKelvey 2006a). This was observed at AU-U. Although the transition from legacy to a digital platform was predefined, the digital platform itself evolved in unforeseeable ways as end-users and developers continued to shape its course.

Complex systems such as digital platforms often exhibit a nonlinear evolution and cannot be compared to the linear progression of development of past-generations of IT systems (Hanseth and Lyytinen 2010). Nonlinear leaping demonstrates a mechanism that is in contrast to the traditional and often linear and predictable software development. It is also more complex than platform development described in platform ecosystem literature, characterised by relationship management between the platform owner and the third-party developers (Parker et al. 2017; Qiu et al. 2017). Platform development in traditional organisations usually consists of vendors, consultancies and internal IT departments, generating a complex web of relationships (Bygstad and Hanseth 2018). Indeed at AU-U the same level of complexity persists, making platform development a complex and nonlinear process, where multiple parties (including the academics) influence the process.

Multilevel platform development

Multilevel platform development relates to the development of new platform functionality being driven from both the micro and the macro levels, from within and from outside the organisation's boundaries, as well as cross-organisationally. For example, on the micro side, in addition to the traditional development function (observed in all three cases), the lower-

levels of the organisation had the ability to engage in platform development activities that may have previously required expert knowledge (e.g. in case Beta). Business users with no specific programming knowledge were able to develop platform functionality using a low-code module. On the macro side the development of the platform was driven from the higher-levels of the organisation and from outside the organisation. For example, platform Gamma had to adapt to accommodate the changes in the business model (from B2C to B2B). To cater for a more personalised experience, a customised instance of High-Ed M was set up for each client organisation. Moreover, to accommodate mass-enrolments for these organisations, the existing manual processes conducted through a spreadsheet became inefficient. To address this shortage a new dashboard module was developed for the client organisation to administer their learners. An example of cross-organisational platform development was platform Beta leveraging the platform Gamma model for a part of its functionality with the ability to reuse the existing logic.

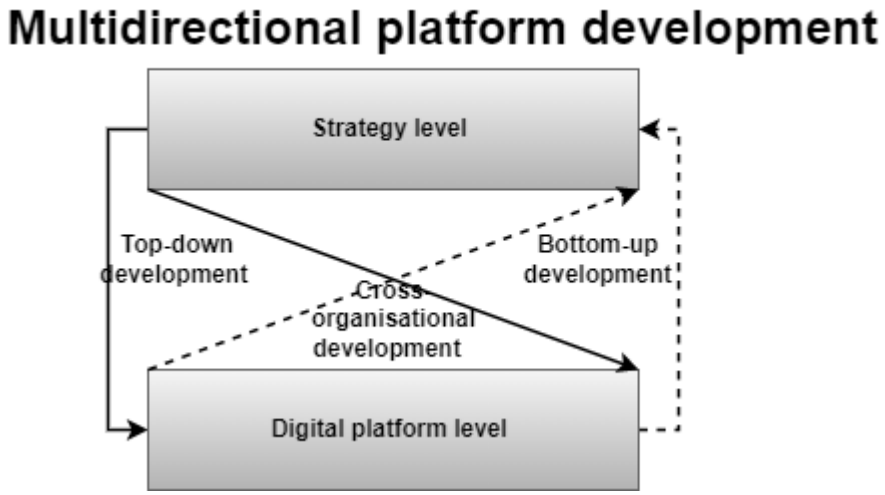

Figure 28 — Multilevel platform development mechanism

This is consistent with observations of IS development being multilevel and multidirectional (e.g. top-down and directive, bottom-up and emergent), as well as horizontal or diagonal (Benbya and McKelvey 2006a; Vessey and Ward 2013). Bottom-up process between and across levels can lead to the emergence of new structures that have transformational effects (Volberda and Lewin 2003). This was also observed in case Beta. Although the initial vision for the digital platform was formulated from top-down, the ongoing design unfolded as an emergent collection of bottom-up, as well as diagonal (cross-organisational) processes.

The cross-organisational software development trend is reflected in concepts such as DevOps and BizDevOps where continuous delivery is managed by cross-functional teams, using agile methodologies which lead to greater alignment between different functions. Moreover, digital platforms allow cross-functional teams to continually produce new functionality without the need for coordination with other organisational units and systems, leading to greater generativity than possible with siloed monolithic structures (Vestues 2019). On platform Beta, new functionality could be implemented rapidly through agile methods, without the need for lengthy planning and coordination with other areas of the organisation.

This mechanism demonstrates that digital platform development deviates considerably from traditional software development, even one employing agile methodology (Vidgen and Wang 2009). In the empirical data presented here, we can see that requirements from outside the organisation drove platform development at AU-U. This illuminates a different process to that of developing software for clients, one where the organisation's own digital platform evolves

due to the requirements of external parties. Moreover, traditionally development is often reserved for professional software developers (Vidgen and Wang 2009), yet digital platforms appear to be challenging this paradigm. The emergence of low-code alternatives and the ability to abstract IT capabilities enables even business users to engage in the development process (Gregory et al. 2018).

The emergence of 'low-code' platforms for software development is empowering non-technical users to engage in the development process and bridging the IT and business divide. This can be useful in bringing about solutions quickly, when there is a shortage of developers and the stigma around software project failure impeding DT efforts (Bock and Frank 2021).In case Beta a low-code module was used to quickly develop booking functionality for the digital platform.

I conclude this section with the following propositions:
P8. Digital platform development for DT is a multilevel, nonlinear process, where the requirements emerge from both internal and external parties to the organisation, leading to unpredictable development patterns.
P9. Digital platform development for DT encourages business users to get involved in the development process through low-code platforms and configurable components.

Table 26 — DT through platformisation propositions for stable contexts

	Category	ID	Proposition
Strategy-Centric Mechanisms	**Strategising**	P1	DT through platformisation requires dynamic and democratised forms of strategising, engaging multiple levels of the organisation, through formal and informal processes.
	Digital Organising Logic	P2	DT through platformisation requires more fluid ways of organising teams, organisational and governance structures, including the introduction of new processes to support the evolution of digital platforms.
	Innovation	P3	DT through platformisation hinges on continuous innovation to redefine and introduce new value propositions, including boundary-spanning value co-creating with internal and external parties.
Digital Platform-Centric Mechanisms	**Digital platform Architecture**	P4	Architecting digital platforms requires a democratic approach, giving an organisational domain more autonomy over its platforms, whilst being federated by a centralised architectural function.
		P5	Architecting digital platforms requires the ability to integrate, disintegrate and recombine components, according to the rules of modularity.
	Digital Platform Design	*P6*	Digital platform design for DT through platformisation is an ongoing process of feedback and implementation between multiple parties, both internal and external parties, without predefining an end-goal, but contending that priorities are continually shifting.

		P7	Digital platform design for DT through platformisation requires culture changes to support exploration and experimentation.
	Digital Platform Development	P8	Digital platform development for DT is a multilevel, nonlinear process, where the requirements emerge from both internal and external parties to the organisation, leading to unpredictable development patterns.
		P9	Digital platform development for DT encourages business users to get involved in the development process through low-code platforms and configurable components.

6.2.2 Mechanisms in Extreme Contexts

This category of mechanisms focusses on the extreme contexts, observed during the COVID-19 pandemic. Inspired by Snowden and Boone's (2007) Cynefin framework, rooted in complexity thinking, I recognise these contexts as the realms of complexity and chaos, marked by uncertainty, which unlike simple and complicated contexts, cannot be understood through cause and effect logic. Chaotic contexts, the domain of "unknowables" are characterised by accelerated, unanticipated change and no manageable patterns, requiring novel practices. Complex contexts, are described as the "unknown unknowns" and are marked by emergent patterns and experimentation . The difference between these two extreme contexts is that in complex conditions there is more leeway for action, as the right path emerges, whereas in chaotic contexts the imperative is to act immediately (Snowden and Boone 2007). Investigation in complex environments leads to the emergence of new solutions in order to stabilise the organisation. In chaotic environments, where order needs to be restored as soon as possible, there is no adequate time to contemplate the right solution. I associate chaotic contexts with the *Improvisational* mechanisms and complex contexts with *Experimental* mechanisms.

There are two overarching principles of adaption that apply to all the mechanisms described below — *requisite variety* and *adaptive tensions.* According to the principle of requisite variety, the rate of change in the internal environment must match or exceed the rate of change in the external environment (McKelvey 2002; Vidgen and Wang 2009; Vessey and Ward 2013). Consequently, to bear the changing conditions, the university had to be constantly generating internal change to match the rate of external change in order to survive. *Adaptive tensions* refer to the forces imposed by the external environment that prompt a restoration of order between the coevolving levels (Benbya and McKelvey 2006b; Montealegre et al. 2019). At the university, the coevolving levels were the strategic level and the digital platform level that were continually adjusting as a result of the environmental perturbations. While the mechanisms observed in stable context are a confluence of strategy-centric and digital platform-centric mechanisms, the mechanisms observed in extreme contexts are a hybrid of the two. These mechanisms helped to accelerate DT through platformisation efforts.

- **Improvisational Mechanisms**

In turbulent and often chaotic environments defined by uncertainty and high-velocity change, upfront planning gives way to improvisation. Improvisation allows organisations to extemporaneously reorganise existing resources to sustain their operations in unanticipated and unfamiliar circumstances (El Sawy et al. 2010 ; Pavlou and El Sawy 2010). The

mechanisms presented in this section demonstrate how an organisation can survive amidst such conditions and accelerate their DT efforts.

Multidirectional sensing

This coevolution mechanism denotes the monitoring and awareness of the micro and the macro environment. It is based on coevolutionary *multidirectional effects.* For example, at AU-U*, at the micro-level,* as security threats arose on the digital platform, they were recognised and reported early by the end-users themselves. In addition to the existing reporting processes, new ones were quickly established to enable fast reporting of a wider set of issues, at the strategic level. At the macro level, on the other hand the case organisation took heed of the changing legislative directives regarding COVID-19, but also considered how other universities and organisations were responding, which led to opening access to the digital platform to international students. This mechanism is supported by the previous studies, which confirm that effective scrutinising of the environment builds collective awareness to generate sense-making strategies, when varying environmental cues disrupt regular activity (Maitlis and Sonenshein 2010). This particular mechanism triggered the cross-organisational fast feedback loop mechanism, described next, which ultimately led to changes being made on the digital platform.

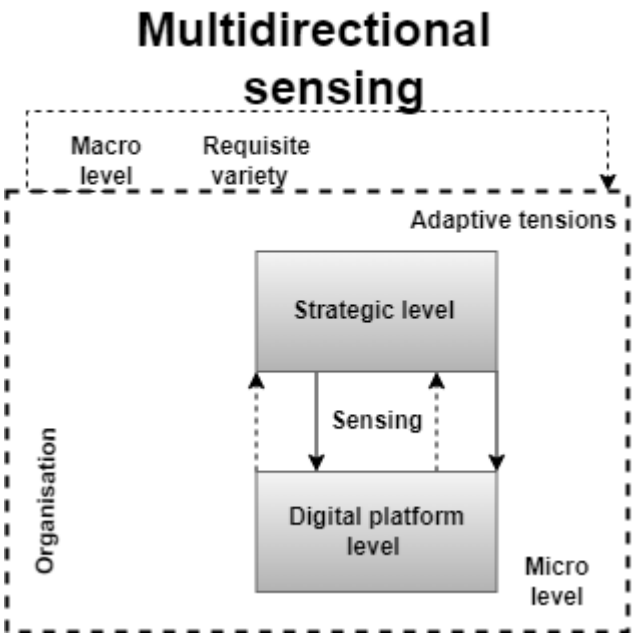

Figure 29 — Multidirectional sensing mechanism

Cross-organisational fast feedback loops

Cross-organisational fast feedback loops were observed as a balance-restoring mechanism in extreme contexts, which involved fast reporting and resolution of critical issues along multiple levels of the organisational hierarchy. I interpret this mechanism as a *negative feedback, balancing loop,* generating *multilevel effects*. Negative feedback seeks to establish equilibrium by balancing out negative effects (Benbya and McKelvey 2006b). *For example*, in the case organisation, this mechanism facilitated fast decision-making, as threats and issues in the internal and the external environment were reported and escalated, resulting in changes to the digital platform. Security issues on the digital platform were reported by the end-users

and escalated quickly. Similarly, scanning the external environment, identified a need to open up the digital platform to international students via a VPN and select digital platforms that were in line with legislative and operational constraints of those counties. Multilevel coevolution effects happen at multiple levels within the organisation, as well as between the organisation and the environment (Lewin and Volberda 1999). For example, the employees taking part in the decision-making process were all at different levels of the organisational hierarchy and from different departments, collectively contributing to change. The decisions along the chain of command all collectively contributed to stronger security and identity management measures on the digital platform, as well as a selection of modules that were appropriate for international students to access remotely.

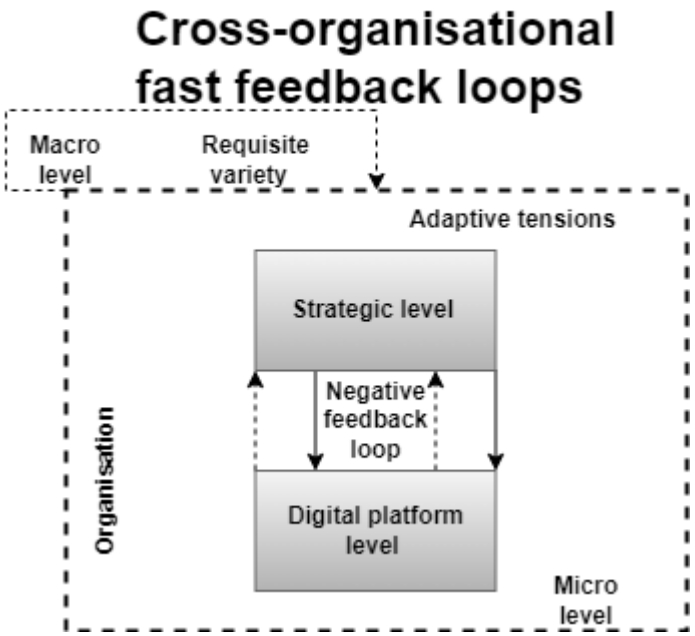

Figure 30 — Cross-organisational fast feedback loops

Agile affordances

This mechanism allowed novel affordances and work practices enabled by the digital platform. I recognise this as the coevolution property of *emergence.* As human and technical agents interact in unknown and unplanned ways, they create new complex systems and patterns (Vessey and Ward 2013). For example, AU-U's efforts to adapt, the academic, as well as the professional staff at the university used the modules in the digital platform in ways that were originally unanticipated. Moreover, the use of online chat modules, previously underutilised, became instrumental for running support services, as well as events at the university. In the same vein, the use of CollabU provided an alternative for teaching and learning, as well as file sharing.

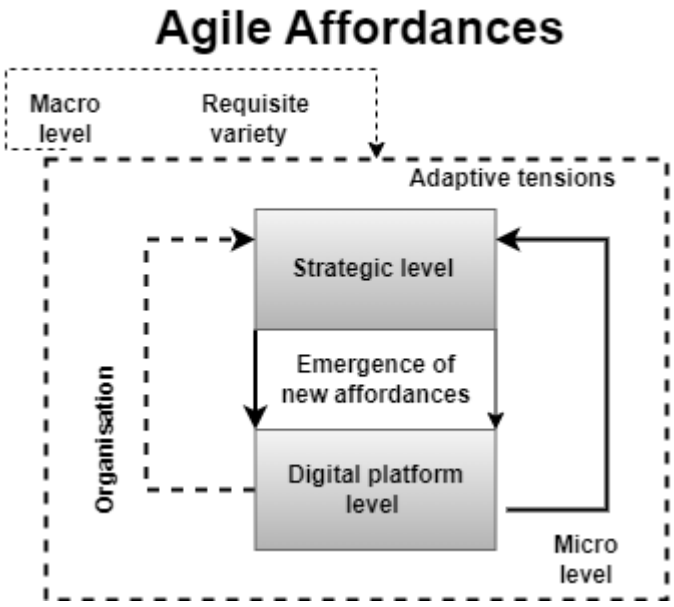

Figure 31 — Agile Affordances Mechanism

Agile redesign of critical operational processes

This mechanism is perceived as the redesigning of critical operational processes to adapt to the external environment. It is based on the property of *emergence.* As agents (both human and non-human) interact, they produce new patterns (Allen and Varga 2006; Vessey and Ward 2013). For example, the introduction of an invigilation module, required a redesign of the operational process of conducting exams online. This involved addressing privacy concerns by introducing a new process for obtaining student consent, as the existing forms and policies no longer fitted the new situation. It became evident during COVID-19, that the introduction of new digital solutions necessitated new processes in tandem with technology changes (Bygstad et al. 2022). Higher-levels of IT infrastructure could equate to a more rapid redesign of organisational process (Broadbent et al. 1999).

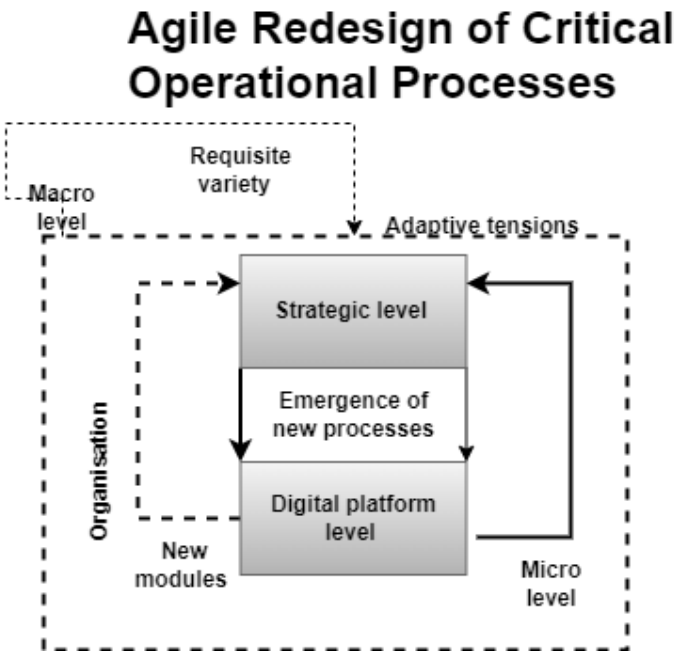

Figure 32 — Agile redesign of critical operational processes

Adaptive strategising

Adaptive strategising can be described as a mechanism allowing the agents to spontaneously organise into a new form without formal authority driving the process to make decisions about digital platforms. It is based on the principle of *self-organisation.* For example, at AU-U new emergency committees emerged without formal governance or directives in response to the crisis. Previously planned digital initiatives were put on hold and reprioritised, as new, more urgent requirements came up. Self-organising behaviour through spontaneous actions during a crisis can help to establish order in an organisation (Nan and Lu 2014).

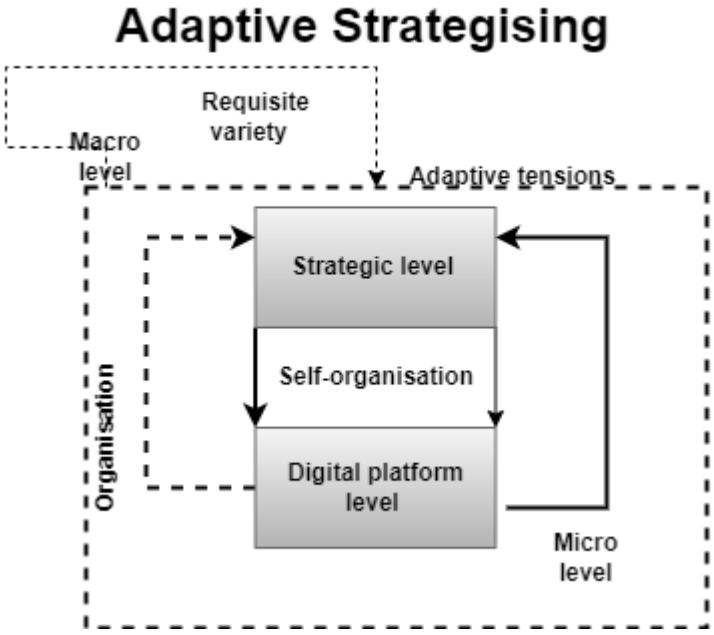

Figure 33 — Adaptive strategising

Reactive digital fit

This mechanism represents a reactive response to increase the digital fit of the organisation to cope with the external circumstances and includes adaptations to both the workforce and the digital platform. I recognise this mechanism as exhibiting *nonlinear* dynamics. For example, COVID-19 as a dramatic event was the driving force behind the increased adoption of modules in the digital platforms at AU-U, and the requirement to scale up the modules by increasing the number of licenses to keep up with the demand. Nonlinear dynamics are not always instigated by insignificant events, dubbed “butterfly effects”, but phase transitions caused by dramatic events (McKelvey 2002).

Achieving the required digital fit required *multilevel* adaptation. For example, to adapt to the new online mode of operation, both formal and informal upskilling of staff took place. Formal digital training sessions were offered through the Support services department, but also peer knowledge-sharing proliferated, as academics shared ideas amongst themselves on how to use the different technologies for their work practices. When heterogeneous agents learn from each other, this increases their adaptive capability (Boisot and McKelvey 2010).

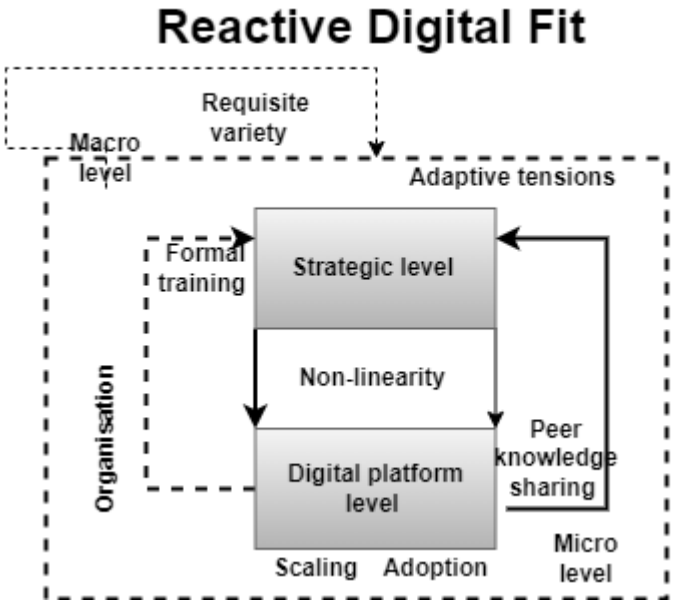

Figure 34 — Reactive digital fit mechanism

Increasing architectural resilience through variation

This mechanism relates to extending the digital platform by adding more modules to increase variation, and consequently the adaptive response. It is based on the principle of *modularity*. For example, to meet urgent demands, such as conducting exams online, the university relied on emergency, simplified procurement procedures, as there was no time for the usually elaborate and lengthy procurement process. A module that met the minimum requirements was selected, tested, procured and implemented in record time. This allowed AU-U to remain resilient by supporting one of its core functions, which due to COVID-19 had to be done online. Consistent with prior literature, a modular digital platform design, engendering a variation in complimentary components, supports its continual evolution (Tiwana et al. 2010).

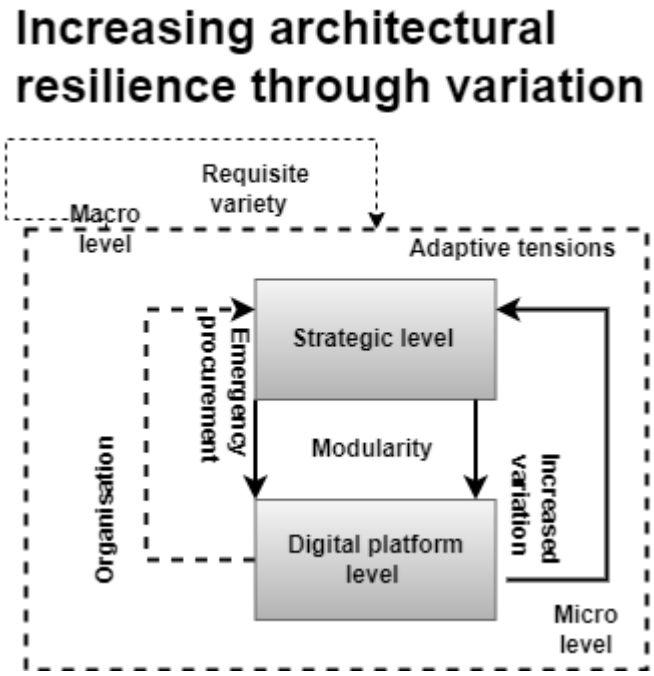

Figure 35 — Increasing architectural resilience through variation mechanism

- **Experimental Mechanisms**

In complex environmental settings, experimentation can provide viable solutions to emerge in extreme contexts (Snowden and Boone 2007). Experimentation can dissolve old work practices and processes, through innovative use of digital technology, engendering new ways of operation (Bygstad et al. 2022). The mechanisms presented in this section demonstrate how an organisation can cope in extreme contexts and accelerate DT through platformisation by experimenting with existing resources.

Agile re-composition of technical and organisational resources

This mechanism refers to the re-composition of existing socio-technical resources to increase the overall adaptability of the system or organisation. It is based on the principle of *modularity.* For example, AU-U made a number of integrations and reconfigurations between its modules to produce new solutions, such as integrating video conferencing with one of the core systems for a more seamless experience. At the organisational level, human resources were reoriented to meet more urgent goals, and new learning centres opened abroad employing university staff.

Similarly, prior research has observed DT through platformisation as a sequence of decoupling and recoupling monolithic systems and hierarchical organisational structures (Vestues and Rolland 2021). Decoupling of digital platform components can engender the emergence of new solutions (Benlian et al. 2018), and new ways of organising (Yoo et al. 2010). Near-decomposable units in a system (whether artificial of social), with minimum interdependencies, can increase the rate of adaptive response (Benbya and McKelvey 2006b ; Sanchez and Mahoney 1996). Indeed, the modular nature of the digital platforms at AU-U and the

reorganising of human resources to deal with newly posed challenges increased the rate of the adaptive response.

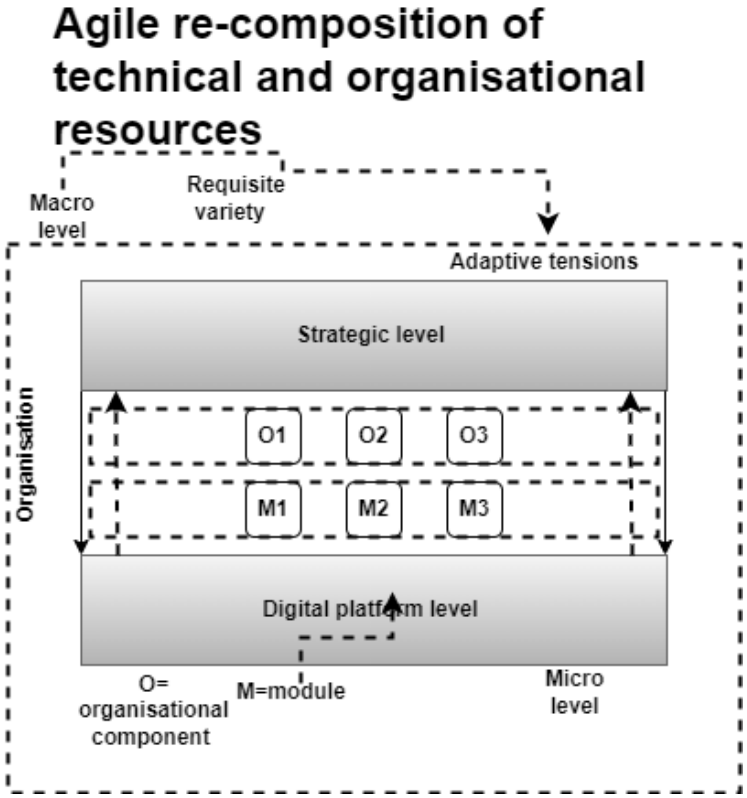

Figure 36 — Agile re-composition of technical and organisational processes

'Pendulum-like' governance

This mechanism was observed as an alternation between dialectic dualities of formal and participatory governance. It is based on the principle of *oscillation dynamic*s. For example*, a*s vendors raced to bring out new features for the modules, the university through its governance process would make a decision on whether to enable a new feature or not. Although an upcoming CollabU feature was already available in ChatU, the users' predilections for CollabU exerted influence on the IT department to still enable the feature. Both modules had superior features in relation to the other, and hence it was deemed appropriate for the features to coexist in different modules. However, when user groups proposed a divergence from HighEd M, in favour of CollabU for teaching, this was not supported, due to the university's formal structures and procedures. The extant literature recognises the paradoxical nature of such dualities and their inability to be resolved, but rather managed as a dynamic equilibrium (Smith and Lewis 2011) and Lewis 2011). To that end, the tensions between the opposing poles alternate with an irregular rhythm (Thomas et al. 2005).

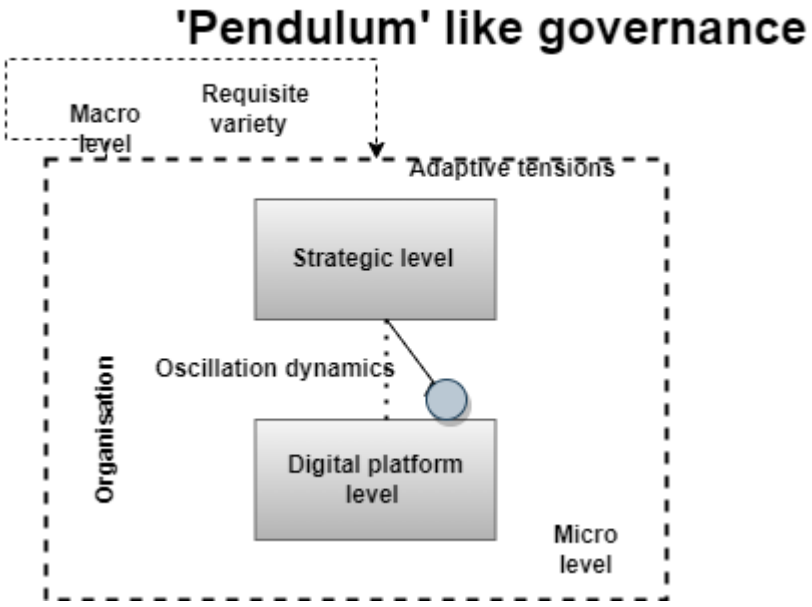

Figure 37 — 'Pendulum' like governance mechanism

I conclude this section with the following propositions:

P10 Monitoring of the internal and the external environment in extreme contexts to identify and escalate threats through multiple levels in the organisation can lead to fast resolutions and maintain stability of DT through platformisation.

P11. DT through platformisation can be accelerated in extreme contexts through improvisation and experimentation.

> *P11 (a) Reconfiguring organisational structures, digital platforms and operational processes can accelerate DT through platformisation in extreme contexts.*
>
> *P11 (b) Updating governance structures to allow for formal and participatory models and extending digital platforms through the addition of new modules can accelerate DT through platformisation in extreme contexts.*
>
> *P11 (c) Scaling, continually identifying new affordances with digital platforms and upskilling staff in digital acumen can accelerate DT through platformisation in extreme contexts.*

6.3 Summary of the Theorisation Section

In this chapter, I theorised DT through platformisation through a theoretical model and mechanisms of DT through platformisation, organised into a framework, as well as a number of theoretical propositions. While the model provides an overview of the DT through platformisation process in the context of the macro-micro environment, the mechanisms provide micro-level means of achieving DT through platformisation. A number of theoretical propositions have been derived from the mechanisms to better articulate my contribution. In the next chapter, I proceed to discuss this theorisation in the context of the existing literature and provide the evidence for answering the research questions this thesis set out to answer.

Chapter 7: Discussion

In this chapter, I place the empirical findings and the theorisation in the context of the existing literature. To reiterate, given the broad nature of the literature on DT, the specific focus of this research is on DT through platformisation, as the main phenomenon, and hence this is the focus of this discussion. I provide evidence for answering the overarching research question of this thesis:

- *How can organisations achieve DT through platformisation?*

Following a discussion on the overarching research question, I address the two sub-questions:

- *Through which mechanisms does DT through platformisation occur?*
- *What are the organisational outcomes of DT through platformisation?*

In doing so, I contribute to the discussion on the streams of literature on DT and digital platforms within the IS field, as well as the emerging stream of DT through platformisation.

7.1 How can organisations achieve DT through platformisation?

I posit that DT through platformisation is achieved through an interplay between the strategic and the digital platform levels in the organisation. This thesis answers the overarching question by proposing a theoretical model (see section 6.1). By employing the theory of coevolution, a more holistic view of DT through platformisation is provided, theorised as a mutual interplay between the strategic and the digital platform levels and their environment. Recent theorisations, adopting the coevolution theory have focused on IT systems in general, not digital platforms, as part of ITOT (Taj et al. 2021). Yet, ITOT is considered a different phenomenon to DT (Wessel et al. 2021). Other studies employing coevolution, as a lens focused on inter-organisational dynamics of B2B ecosystems in manufacturing industries (Jovanovic et al. 2022). In contrast, this thesis takes on an intra-organisational perspective, one that has not been addressed in the literature to a great extent. To that end, this thesis offers a unique perspective on DT through the angle of platformisation by analysing the multilevel interplay between the strategic and the digital platform levels, conducive to the emergence and ongoing evolution of digital platforms in the organisational setting.

By conceptualising the strategic level as a dynamic form of *strategising* between a diverse set of stakeholders from different levels of the organisational hierarchy, I address both the strategic and the operational aspects of the process, for a more holistic view, as advised by (Wessel et al. 2021). For example, the TransformationHub embodies both the strategic processes required to set the general direction for the digital platform, as well as day-to-day operational processes to ensure best practices and operational efficiency. The more holistic focus, enabled by coevolution theory (Hanelt et al. 2020), allowed me to focus on the intra-organisational context, whilst at the same time recognising the impact of external environmental factors contributing to the coevolving relationships.

I postulate DT through platformisation as a process is achieved through a number of mechanisms between the strategic and the digital platform levels (discussed in more detail below), that are socio-technical and both deliberate and emergent in nature. Prior conceptualisations largely treat mechanisms as intentional (Bygstad 2021). However, the coevolutionary lens recognises and accounts for both deliberate and emergent processes. Whilst acknowledging that managers can actively influence the coevolution processes, often

relying on past experiences, emergent processes, traversing different levels in the organisation can be just as transformational (Volberda and Lewin 2003).

I extend the usual perception of top-down change being deliberate and bottom-up change as emergent. (Volberda and Lewin 2003; Vessey and Ward 2013; Wimelius et al. 2020). In this thesis, the findings show that top-down change can be both deliberate (e.g. in the form of deliberate organisational strategy) and emergent (e.g. during COVID-19 a lot of the top-down strategising to remain viable became emergent due to the unpredictable conditions). Whilst argued that in these cases the process of emergence is not one of blind variation, with management most likely having a deliberate intention as to what path to pursue (Volberda and Lewin 2003), this may not hold true in extreme circumstances, such as COVID-19.

Similarly, bottom-up change is not always emergent. Empowering lower levels of the echelon allows them deliberate decision-making rights (e.g. setting up of TransformationHub). In contrast to studies implying a contentious relationship between deliberate and emergent change on DT programs (Wimelius et al. 2020), I find that this can also be a harmonious and integral part of the journey of DT through platformisation.

In this thesis, I also posit that DT through platformisation unfolds through the emergence and evolution of different internal digital platform types in an organisation. For AU-U, these types were *productivity*, *collaboration* and *innovation* digital platforms representative of both operational and strategic goals. With this I extend internal digital platform literature beyond product platforms in manufacturing industries (Gawer and Cusumano 2014). These studies usually focus on IoT platforms (Sandberg et al. 2020; Jovanovic et al. 2022), which are fundamentally different to enterprise platforms (Bartelheimer et al. 2022), discussed in this thesis. The common theme of this stream of digital platform literature is the reuse of components to achieve economies of scale and scope of physical products (Gawer 2014), which may not be applicable to other industries. Noting that organisations can build digital platforms "not just of products but of digital capabilities used throughout the organisation to support its different functions" (Yoo et al. 2012 p. 1400), this study shows that indeed the implications of internal digital platforms reach further than product development.

The findings also compliment prior studies positing internal digital platforms as an evolutionary step to ecosystems, while extending their focus beyond the manufacturing industry (Gawer and Cusumano 2014; Sandberg et al. 2020). I find that internal digital platforms may indeed be a necessary precursor to an ecosystem. For example, platform Beta started as an internal digital platform, but the vision for the future is to open it up for external collaboration. For this to occur it will need to reach a certain level of maturity.

By articulating internal digital platform types, I answer the call for extending the scope of digital platform research by de Reuver et al. (2017), to understand how incumbent organisations can leverage digital platforms. I also extend the discussion on innovating through digital platforms in a variety of traditional industries (Sedera et al. 2016; Sebastian et al. 2017; Törmer 2018), to the higher education sector. I also contribute to the emerging discourse on the different uses of internal digital platforms within organisations (Richardson et al. 2014; Törmer 2018; Rolland 2021).

In answering de Reuver's et al. (2017) call on how digital platforms emerge, the findings show that internal digital platforms can emerge through a confluence of the following: internal development through a reconfiguration of existing components, build of new components (e.g. platform Beta), the procurement of third-party apps (e.g. platform Alpha), or partnering with third-party digital platform providers (e.g. prototype in platform Gamma). In an incumbent organisation, multiple and diverse digital platforms can coexist, with modules shared between

digital platforms, a more complex landscape than that originally discussed by early digital platform literature — see for example (Tiwana et al. 2010). More importantly, I elucidate how digital platforms enable DT, a long-standing question that has received little empirical support (Hossain and Lassen 2017).

This research finds that DT through platformisation also unfolds through the emergence of different types of ecosystems — an internal ecosystem (e.g. in Platform Beta) and an external ecosystem (e.g. in Platform Gamma). With this I extend the literature on internal ecosystems, which are the least researched type of ecosystems in the literature (Wang 2021). However, the merit of exploring the internal ecosystem concept has been recognised, as a way of cultivating internal employee interactions and their service-making capabilities in the manufacturing industry (Baik et al. 2019). I extend the focus of this research from human resource (HR) practices to how an internal ecosystem can foster better collaboration and support the evolution of the digital platform. For example, at AU-U, an internal ecosystem emerged around platform Beta, connecting the different faculties and other stakeholders in an uplift of the research function. Although, we know organisations can choose to keep their ecosystem closed to internal use within their organisation, or opened up to third-party collaboration (Hein et al. 2019), not many studies have empirically explored the internal ecosystem concept. With this research I provide an empirical example, supporting the definition of an internal ecosystem as consisting of coevolving internal actors, business processes, resources and digital platforms within the boundaries of a single organisation working towards common goals (Wang 2021). Indeed, I found platform Beta internal ecosystem to be a constellation of internal stakeholders (research areas from the university), the digital platform, the business processes (e.g. collecting feedback) and resources (e.g. training modules, funding opportunities).

With this study, I broaden the scope of research on ecosystems to the higher education sector, which has not been explored to a great extent, despite increasing evidence of university-industry collaboration (Ankrah and Al-Tabbaa 2015; Osorno-Hinojosa et al. 2022). The literature to date has explored ecosystems in the context of DT in a number of other industries such as healthcare (Hermes et al. 2020), entertainment (Tan et al. 2020), automotive (Svahn 2017), manufacturing (Sandberg et al. 2020), blockchain, financial services and insurance industries (Riasanow et al. 2020). In contrast to this prior research, the findings show an alternative view of co-creating value with industry partners as clients in an ecosystem, while at the same time contributing to the wider society, as observed in case Gamma. To that end, this research contributes a novel perspective on ecosystem value co-creation in the higher education sector (a shift from B2C to B2B to B2B2C), which has not been observed in prior literature, to the best of my knowledge.

7.1.1 Through which mechanisms does DT through platformisation occur?

To answer this research question, I posit that DT through platformisation is achieved through a number of mechanisms between the strategic and the digital platform levels. In focusing on linear implementations of a system to understand the before and after states, prior studies of IS change have neglected the dynamics and mechanisms of change (Lyytinen and Newman 2008), and DT as a type of organisational change is no exception. In contrast to earlier literature alluding to an end-state to DT efforts (Matt et al. 2015), and the more recent studies focusing more on the before and after states of DT through platformisation, this study contributes to an increasing recognition of DT as an ongoing process (Chanias et al. 2019; Vial 2019).

This is because today's organisations operate in highly dynamic and often turbulent environments, where the attained competitive advantage can be quickly eroded (Pavlou and El Sawy 2010). Moreover, the generative nature of digital technologies renders these technologies perpetually incomplete (Yoo 2013). Similarly, at AU-U, although high-level objectives for DT through platformisation were defined at the strategic level, they were continually evolving and adapting to pressures imposed by the environment. This creates challenges which Baiyere et al. (2020) describes as: "this simultaneous attention to the generativity and deep structure change that characterise digital transformation, is akin to 'changing the wheel on a moving vehicle' " (p.242). At AU-U the deep structure changes were indeed triggered by radical episodes (such as the changes in the postgraduate market and the COVID-19 pandemic), yet they ultimately resulted in a continuous change.

This study is the first to propose mechanisms of DT through platformisation in a large, established organisation, according to the literature. With this work I extend the context from SMEs in the retail sector (Li et al. 2018; Mandviwalla and Flanagan 2021) to a larger, more complex type of organisation. Recent work on mechanisms in an established institution have only been explored in the context of ITOT and DIs (Bygstad and Øvrelid 2020).

I also bring greater clarity to the term 'mechanism', which has been used loosely in the literature. For example, viewing the management of paradoxical tensions as a mechanism (Wimelius et al. 2020) presents a problem, as these paradoxical tensions ultimately did not lead to the desired outcome. There is also a tendency to use the term 'mechanism', without explicitly making mechanisms the focus of the study, or providing a clear definition as to what a mechanism is (Resca et al. 2013; Sandberg et al. 2020). This leaves the discourse on mechanisms of DT a convoluted and obscure area to sift through.

This thesis makes an empirically and theoretically grounded contribution on DT mechanisms, through the angle of platformisation, which have to date, been largely inferred from the literature (Hanelt et al. 2020; Urbinati et al. 2021). I also answer recent calls for research, urging scholars to expand their theorising on DT, with mechanisms as an appropriate way to present theory (Markus and Rowe 2021; Markus 2021). No prior work has produced such an extensive list of mechanisms, or gone to the extent of classifying them into a theoretical framework.

With this thesis, I also extend the previous one-dimensional perspective on mechanisms by presenting a multilevel view, facilitated by the coevolution theory, as the theoretical lens. Prior work on mechanisms, see for example — (Henfridsson and Bygstad 2013; Huang et al. 2017) have focused on evolutionary dynamics alone. While coevolution is still dependent on the operation of the basic elements of Darwinian selectionist theory: blind variation, selection, and retention (Campbell 1965, McKelvey 1982, 1994; Aldrich 1979, 1999), coevolutionary dynamics focus on the mutually-shaping interactions between entities rather than viewing entities in isolation, as is the case with evolutionary studies (Peppard and Breu 2003).

Moreover, I extend the focus of these studies on mechanisms of DI evolution (Henfridsson and Bygstad 2013; Huang et al. 2017) to digital platforms, which are deemed distinct phenomena (Hanseth and Lyytinen 2010; Törmer 2018 b). I also extend the focus of these studies from nascent industries and more simplified IT landscapes to an established organisation with a more complex technical environment.

This thesis makes a novel contribution by dividing the mechanisms between stable and extreme contexts, a first of its kind, to the best of my knowledge. The further categorisation of mechanisms in stable contexts into *Strategy-Centric* and *Digital-Platform centric* mechanisms,

as well presenting extreme contexts mechanisms as a hybrid of the two, reveals nuances and leads to a deeper understanding of mechanisms of DT through platformisation.

The first group of mechanisms presented in the Strategy-Centric category are the *Strategising* mechanisms. Through these mechanisms I address a shortage in the literature, which has not paid much heed to the mechanisms of the strategising process (Desouza 2021). Although, the sequences of events in the strategising process require attention, it is important to identify the mechanisms that influence those events (Pettigrew 1992). This thesis addresses this gap by providing two mechanisms of DT through platformisation in stable contexts (*circular strategising* and *bottom-up influencing*) and one in extreme contexts (*adaptive strategising*).

With these mechanisms I contribute to the growing body of literature on IS strategising from the perspective of DT through platformisation. The IS strategy stream has seen a shift from a static representation of strategy to strategising as a process to explain the temporal succession of events that lead to changes over time (Pettigrew 1992). The traditional bifurcation of strategy content (competitive position) and process (formulation and implementation of strategy) persisted throughout the 1980s, notwithstanding the researchers attempting to bridge this divide (Mintzberg 1987; Burgelman et al. 2018). Equally, in this thesis, I find that strategy content and process are in accord and evolve over time. For example, while the long-term organisational strategy provided the content for the strategic direction of AU-U, its general refinement and execution transpired through a strategising process, where new initiatives emerged (e.g. revamp of the postgraduate strategy).

The findings are in accordance with the proponents of the strategising perspective, emphasising the bottom-up activities, involving the lower echelon of the organisation in the strategy process (Henfridsson and Lind 2014). This was also observed at AU-U with the *bottom-up strategising mechanism.* However, in traditional organisations, strategy is still a formal, top-down directive that drives digital platform decisions (Reynolds and Yetton 2015). This multilevel and multidirectional nature of strategising was observed with the *circular strategising* mechanism. In this way, this thesis contributes to the limited discussion on the strategising perspective in the DT literature — see for example (Chanias et al. 2019), but also extends the previous discussions of the strategising concept from platform ecosystems (Ghazawneh and Henfridsson 2011; Staykova 2018) to internal digital platforms in the context of DT, which reflect fundamentally different dynamics.

The second set of mechanisms in the Strategy-Centric category proposed are the *Digital organising logic* mechanisms for DT through platformisation. These mechanisms make an important contribution as they shed light on the operational aspects of DT. With this I expand the strategic focus on DT (Matt et al. 2015; Chanias et al. 2019) to encompass an organisation's operations. Paying attention to new ways of organising are crucial for DT, as organising logic makes up the underlying assumptions, practices and values which become cemented and difficult to change over time (Baiyere et al. 2020). As business silos break down, new cross-functional partnerships emerge (Larkin 2017). This has been observed across all three cases at AU-U.

With this set of mechanisms, I extend the literature on new ways of organising for innovation in the digital era, which has been a focus for over a decade (Yoo et al. 2010) to DT, in a time when organisations find themselves at a cross-roads between digital innovation and DT (Gregory and Tumbas 2019). I also extend the previously proposed platform logic of organising (Sambamurthy and Zmud 2000) to the context of DT. With this I contribute to a pressing question on how the relationship between this new organising logic on DT unfolds and how it can transform "the structure, strategy, culture, competencies, skills, and technology platforms of incumbent firms in established industries" (Gregory and Tumbas 2019 p.3). In this

thesis, I contribute to this body of knowledge by demonstrating the changes in structure (i.e. *digital metamorphosing, multilevel fusing mechanisms and self-organising value co-creating teams*), governance (i.e. *self-organising governance mechanism*) and new ways of designing processes (i.e. *emergent process design mechanism*).

The third group of mechanisms in the Strategy-centric category are the *Innovation* mechanisms. With this I extend the research focused on the antecedents and outcomes of innovation to the actual mechanisms of innovation (Bresciani et al. 2021a; Urbinati et al. 2021). This is an important contribution, as the nature of innovation in the digital age is more dynamic, incremental and open, deviating from traditional approaches of upfront planning, which can cement the created innovations (Svahn 2017). Since these new ways of innovating do not follow a predictable, linear path (Urbinati et al. 2021), the application of coevolution theory in this thesis has been able to illuminate these nonlinear and multilevel dynamics. Indeed, the innovation mechanisms discovered at AU-U (*adaptive innovation, multilevel co-creation* and *emergent prototyping)* highlight the emergent and continually adaptive nature of digital innovation, requiring greater flexibility. Moreover, these mechanisms extend the focus to the higher education sector, often neglected in the literature, with most studies focusing on manufacturing companies (Törmer 2018; Sandberg et al. 2020).

The Innovation mechanisms also contribute to the emerging discussion on the implications of DT on innovation (Gregory and Tumbas 2019; Drechsler et al. 2020), as well as extending the digital innovation literature (Yoo et al. 2010; Henfridsson and Yoo 2014). In line with studies highlighting that digital innovation induces a new organising logic, where the new innovation pathways are partitioned off from the core business (Leijon et al. 2017; Svahn 2017), I also found that at AU-U, new dedicated teams emerged to lead the innovation efforts on platform Gamma, separate from the core business (see the *self-organising value creating teams* mechanism). This innovation also ultimately led to the emergence of an external ecosystem (see the *multilevel co-creation* mechanism). With these findings I contribute to recent calls for a better understanding of the way organisations coordinate and utilise resources for value creation and capture through digital technologies (Urbinati et al. 2021), in particular digital platforms.

In the Digital-platform centric category, I present *digital platform architecture, design and development* mechanisms. The *digital platform architecture* mechanisms extend the very limited research focused on architectural mechanisms of internal digital platforms (Törmer 2018). I also extend the focus on the architectural aspects of B2B platforms (Jovanovic et al. 2022) and DIs (Grisot et al. 2014; Koutsikouri et al. 2018; Bygstad and Øvrelid 2020) to enterprise platforms, which are architecturally different. Concurring with the limitations of enterprise architecture (EA) as a traditional tool for organising technology and structures, this study contributes to a recent discussion proposing a more dynamic approach, inspired by digital platforms (Masuda et al. 2021a; Masuda et al. 2021b). However, contrary to studies positing platformisation, driven by DIs as more evolutionary, rather than designed, this study finds that digital platforms can indeed be designed, but their subsequent evolution transpires as a result of complex coevolutionary dynamics. With the digital platform architecture mechanisms I also contribute to a greater understanding to how evolvable systems help organisations in adapting to their environment (Agarwal and Tiwana 2015).

This study also extends the research on governance, often studied in tandem with digital platform architecture (Tiwana et al. 2010; Hanseth and Rodon Modol 2021; Jovanovic et al. 2022). This thesis contributes three governance mechanisms — *self-organising governance* in stable contexts *and 'pendulum like' governance* in extreme contexts to this stream of literature, which are unique due to their focus on the internal organisational environment, as

opposed to platform ecosystems with external parties. Moreover, they provide a contrast between governance in more stable contexts and governance in extreme contexts. To the best of my knowledge, while studies have been devoted to uncovering how governance regimes can transform an organisation (Gregory et al. 2018), we have not seen many studies address how the governance model changes when unexpected shifts arise, causing organisations to react with greater speed. *Self-organising governance mechanism* suggests that platform governance in the context of DT goes through a more dynamic and improvisational process, while *'pendulum like' governance* identifies a pattern that alternates from formal to participatory governance in extreme contexts. These mechanisms challenge some of the existing governance paradigms posited (e.g. centralised, decentralised regimes and federated) (Sambamurthy and Zmud 2000; Tiwana and Konsynski 2010; Törmer 2018 b), by proposing alternative ways of governing digital platforms in the context of DT.

Moreover, governance mechanisms observed in this thesis are vicarious to examining the interplay between the strategy and the digital platform, a consideration not made in previous research. Yet, we can infer strategy to be an antecedent to governance decisions (Tilson et al. 2012). Hence, the consideration paid to the strategic level in this study generates new insights by extending the sole focus on the governance-architecture relationship.

The *digital platform design mechanisms* explain how DT through platformisation can be achieved through design, an area lacking in insights (Tura et al. 2017). This study unpacks several specific design mechanisms (*self-reinforcing platform design, open platform design, multilevel platform design and rapid experimentation)* of internal digital platforms and makes a contribution to this scarce area of research. With this I also extend the literature on the launch and early stages of digital platform evolution, beyond the healthcare industry and the development of mobile apps for users (Sigríður Islind 2018; Islind et al. 2019). The mechanisms also expand the focus from platform ecosystems (Asadullah et al. 2018b) to internal digital platforms. Similarly, the mechanisms also broaden the earlier research focusing on the design of DIs and their scaling efforts (Hanseth and Lyytinen 2010; Henfridsson and Bygstad 2013; Grisot et al. 2014), as well as online communities (Spagnoletti et al. 2015; Barrett et al. 2016) to an intra-organisational context.

The *digital platform design* mechanisms help to clarify our currently limited understanding of how digital platforms as a technical artefact can be designed in the DT context (Vial 2019). With this, I make a first of its kind contribution, to the best of my knowledge. While scholars have recently began discussing design thinking within DT (Magistretti et al. 2021; Vendraminelli et al. 2022), we have not seen any design mechanisms enabled by digital technologies, including digital platforms. Recent contributions regarding dynamic capabilities, drawing on design thinking do not focus on digital platforms (Magistretti et al. 2021). Moreover, capabilities are higher-order constructs than mechanisms, as they do not possess the micro-level detail that mechanisms do. Hence, capabilities can consist of mechanisms that can help an organisation improve its performance (Heimeriks and Duysters 2005).

This research also answers the question posed by de Reuver et al. (2017) on whether digital platforms emerge accidentally or if they can be consciously designed. This study's findings show that in the context of DT, digital platforms can be consciously designed. However, they continue to evolve as a result of both deliberate action and emergence. For instance, platform Beta was launched as a result of a Senior Leader's high-level vision, but continued to evolve through emergent processes, not being focused on an end-goal. They can also be a natural evolutionary step, as organisations transition from legacy systems, as was the case with platform Alpha.

The *digital platform development mechanisms* help to illuminate platform development beyond the context of platform ecosystems. To date most platform development literature has been

centred around platform ecosystems, whether nascent (Shi et al. 2020) or established (Ghazawneh and Henfridsson 2013). Common themes around platform development in this stream of research are the building of third-party complements through boundary resources (Ghazawneh and Henfridsson 2013; Eaton et al. 2015) and cross-platform development (Tim et al. 2020). The mechanisms in this thesis extend these studies by explaining how digital platforms as an IS artefact can be developed within an organisation for its internal use. The mechanisms also contribute to the very limited understanding of platform development within organisations, extending studies on post-merger platform development (Jain and Ramesh 2017), and product-driven, third-party digital complements in the car manufacturing industry (Svahn 2017; Schreieck et al. 2022).

In the recent years, agile approaches to ISD have replaced traditional ISD approaches on pre-planning prevalent in the 1990s (Salmela and Galliers 2022). The digital platform development mechanisms presented in this thesis are challenging some of the traditional approaches to information systems development (ISD). The trend towards agile methodologies gave rise to DevOps, BizDevOps (Vestues 2019) and DevSecOps (Siau et al. 2022) models amongst others. Indeed, a similar trend was observed at AU-U with agile forms of development and rapid delivery being favoured for digital platform development. The flexible nature of digital platforms can reduce the development effort in the organisation, as witnessed at AU-U, with most changes requiring re-configurations only, and custom development being kept at a minimum.

Moving onto the mechanisms occurring in *Extreme contexts*, this category contains the *Improvisational* and *Experimental* mechanisms. With these mechanisms, I offer another perspective to the literature, that to date has focused on DT in much more stable contexts — see for example (Wimelius et al. 2020; Rolland 2021; Senyo et al. 2021). While DT is often associated with a higher rate of change than other types of organisational transformations (Hanelt et al. 2020; Nadkarni and Prügl 2020), the events of COVID-19 brought about an unprecedented amount of change that could not be foreseen in prior research. This acceleration in speed of DT, ushered in by these more extreme contexts has had a profound impact on the way organisations operate, as exemplified by this study. In this way I answer, recent calls for research urging for more insights into the effects of the pandemic on DT (Di Gangi and al. 2022).

Although scholars have started contributing to the discussion on the acceleration of DT during COVID-19 (Madsen 2020; Wade and Shan 2020), there have not been many studies addressing the specific mechanisms of DT during extreme contexts (Mandviwalla and Flanagan 2021). This is a crucial aspect to explore, as the relentlessly rapid rate of change is forcing organisations to act quickly in order to adapt and survive. I contribute to this sparse area of research by broadening the organisational context beyond small businesses and resilience for new ventures (Mandviwalla and Flanagan 2021; Ye et al. 2022) to the context of a large institution, facing more complex challenges. For example, at AU-U projects that would have normally taken a year to complete had to be delivered in a matter of months. Across industries, organisations were being forced to redesign products and seek new partners in an ecosystem to survive the crisis (Seetharaman 2020). Indeed, AU-U partnered with enterprises during this period to offer new forms of education and to generate new revenue streams in light of the falling international student market.

Moreover, this study presents a more nuanced view of the role of digital platforms and DT during COVID-19, than those focusing on these aspects within a small business context (Mandviwalla and Flanagan 2021). For example, I observed that each digital platform at AU-U was affected differently by COVID-19. For Platform Beta and Gamma the change was

minimal, apart from allocating more resources towards online initiatives and remote forms of working and delivering education. Platform Alpha, however went through a radical change, and became essential for the organisation to sustain its core operations, and achieve resilience during the time of upheaval.

To the best of my knowledge, this study is the first to offer a comprehensive list of mechanisms of DT through platformisation in extreme contexts, such as those induced by the COVID-19 pandemic. While past research has examined the role of IS in other types of extreme contexts, such as earthquakes (Nan and Lu 2014; Sarkar et al. 2021), these can be described as one-off events. The COVID-19 pandemic, on the other hand was not a one-off crisis, but a series of events causing profound and unprecedented changes on multiple levels of society. To that end, it required different types of adaptations that were both strategic and emergent. For example, this is highlighted by the *agile re-composition of technical and organisational components* — new committees emerged at the strategic level, but new requirements also came up at the digital platform level, such as a new invigilation module that could not be planned for.

7.1.2 What are the organisational outcomes of DT through platformisation?

This research builds on the recent empirical studies considering the outcomes of DT (Bresciani et al. 2021a) by considering the organisational outcomes through the angle of platformisation. In contrast to prior configurational approaches (Henfridsson and Bygstad 2013), I do not attribute any particular outcomes to a single mechanism. I recognise these outcomes as a result of cumulative, complex coevolutionary dynamics that cannot be traced through cause and effect logic of deterministic, linear systems (McKelvey 2002). In addition to the mechanisms, I capture these outcomes as the observed snapshots in time (Urbinati et al. 2021), recognising that they are continually evolving. This is contrary to studies focusing on the post-transformation outcomes, as an end-goal (Senyo et al. 2021).

In recognising business model transformation as an observed result of introducing new digital value propositions at AU-U, I contribute to the burgeoning literature on introducing new business models through DT (Cennamo et al. 2020; Li 2020; Bresciani et al. 2021a). The digital era is calling for incumbent organisations to leverage new revenue streams based on digital technologies to remain relevant (Nadkarni and Prügl 2020). The ability to redefine existing business models, or create new business models inspired by digital value propositions is one of the key priorities of DT (Vial 2019; Wiesböck and Hess 2019).

This research answers the recently posed question by Hanelt et al. (2020) regarding how changing customer expectations are shaping the design of business models and products. This study finds that lifestyle changes driven by digitalisation are driving DT, by necessitating changes even in traditional institutions such as universities. For example, the emerging need for more flexible, digital forms of learning, accessible anytime and from any location has created a need that a traditional university such as AU-U needed to address. Platform Gamma enabled two business model transformations for AU-U (e.g. to initially providing shorter forms of learning to the postgraduate market and later, to co-created courses with industry partners).

This study contributes a greater understanding of business model transformation through digital platforms in an established organisation, which has to date mainly been addressed through practitioner literature (Cennamo et al. 2020; Sia et al. 2021), with academia lagging behind. I therefore extend the academic literature in this area that has mainly focused on digital technologies, such as IoT (Haaker et al. 2021), blockchain (Dutra 2018) and analytics (Tim et al. 2020) to digital platforms in the higher education sector, an emerging area that has

not received as much attention (Komljenovic 2022). Yet, digital platforms can pose a threat to traditional business models (Bygstad 2020), but also provide opportunities for expansion (Jovanovic et al. 2022), as observed at AU-U. Moreover, I offer a different perspective to the DT stream of literature focusing on how incumbent organisations can transform to a platform model (Jääskeläinen et al. 2021; Şimşek et al. 2022), by demonstrating how a traditional organisation can leverage an internal digital platform to introduce a new business model.

I extend the industry context of prior research on transforming business models through digital platforms from the automotive industry (Svahn 2017), the logistics industry (v. Alberti-Alhtaybat et al. 2019) and the hospitality industry (Bygstad 2020) to the higher education sector. There has been more focus on innovative business models in the higher education sector through digital platforms such as MOOCs (Chen and Geng 2022), but not so much on how a traditional institution such as a university can transform its business model to compete with such threats (Chen and Geng 2022), a gap this study addresses.

In the higher education sector, the proliferation of massive online courses (MOOCs) has put pressure on universities to engage in DT (Mohamed Hashim et al. 2022). Indeed the emergence of MOOCs and other forms of online learning propelled AU-U to embark on its DT journey, which ultimately led to a new business model, alongside its traditional offerings. The trend for the pursuit of multiple business models within a single organisation has been observed elsewhere. Organisations may do this to enter new markets or offer new types of products (Li 2020). As such, they must possess the ability to effectively manage their traditional business models and emerging business models (Enkel et al. 2020). Although platform Gamma pioneered the shift towards short forms of learning and online education — a deviation from AU-U's core business model of tertiary education, the extreme contexts induced by the pandemic have caused a business model transformation across the board, digitising even the traditional course offerings. Similar outcomes have been observed with universities world-wide with the changes likely to have a lasting impact (Madsen 2020).

The insights presented here on transforming business models in a university by engaging in DT through platformisation add to this promising area of research on the transformation of the higher education sector. The findings in this thesis also challenge the recent claims by Bygstad et al. (2022) that generating new business models is not as relevant to the higher education sector, as it is to businesses. Concurring with Komljenovic (2022) the higher education sector, is affected by the ongoing digitalisation, as much as other types of organisations are. Addressing this scarce area of research, this thesis demonstrates a shift from the traditional B2C to B2B, followed by a B2B2C model in the higher education sector, which to the best of my knowledge have not been explored to a great extent. With these findings, I also answer de Reuver's et. al. (2017) question on how digital platforms are impacting organisations, their business models and landscapes.

The organisational outcome of operational efficiency extends the existing strategic focus of DT, often observed in studies (Matt et al. 2015; Chanias et al. 2019). Organisations need to not only change their value propositions, but also the operating models that support them (Berman 2012). This can be observed through the *digital organising logic* mechanisms presented in this study. I also challenge the recent delineations between ITOT and DT in the literature, arguing ITOT reinforces existing value propositions, while DT creates new value propositions (Wessel et al. 2021). This thesis finds that DT is as much about reinforcing existing value propositions, as it is about introducing new ones. For example, propositions were reinforced through platform Alpha, which in turn enabled the creation of new value propositions — (e.g. streamlining technology, enabled the redesign of the whole student experience).Similarly, on platform Beta, operational efficiency was achieved by reinforcing

existing value propositions (e.g. improving processes), but also enabling new ones (e.g. there are plans for the digital platform to connect external collaborators with internal AU-U stakeholders).

This thesis also contributes a greater understanding of organisational resilience in extreme contexts, as an outcome of DT through platformisation. For example, AU-U was able to successfully navigate the turbulence imposed by the external environment by accelerating their DT through platformisation efforts to survive the crisis and stay viable. With these findings I extend the literature on DT which has to date focused on much more stable contexts — see for example (Wimelius et al. 2020). I also broaden the research investigating the impacts of digital platforms in the food and retail (Jayasinghe 2021; Mandviwalla and Flanagan 2021), health (Schaffer 2021) and transport (Ye et al. 2022) industries during COVID-19 to a much larger and more complex context of a university, beyond the teaching and learning aspects (Madsen 2020; Bygstad et al. 2022). Although teaching and learning was considered as part of the organisational context at AU-U, it was not the sole focus, with this study unpacking the strategic and operational aspects of the DT efforts.

Prior research focusing on IS resilience in other extreme contexts (e.g. earthquake response) has not focused on digital platforms, but IS in general, for example highlighting the significance of IT and business alignment (Sarkar et al. 2021). However, digital platforms are fundamentally different from the past generation of monolithic systems, and allow for a much faster adaptation (Hanseth and Rodon Modol 2021). This was witnessed at AU-U. The investments into digital platforms prior to COVID-19 created serendipitous conditions for the organisation to deal with the crisis, which may have not been possible otherwise.

This research also extends prior studies which have inversely found organisational resilience to be necessary for a successful DT (Fleron et al. 2021; Heinz et al. 2021). As such, they found organisational resilience to be an antecedent for DT rather than an outcome of DT, as found in this study. Moreover, organisational resilience in these studies was considered in more stable contexts.

This thesis contributes to the emerging and important topic of organisational resilience in the IS field amidst the pandemic, particularly the impact of digital platforms on resilience, an area in need for new insights (Rai 2020). With this I answer the call for research indicating a need to understand DT, digital platforms and resilience particularly in the public sector, as a result of the external pressures posed by the crisis (Boh et al. 2020). This thesis contributes to this area of research by focusing on all three aspects.

With organisational outcomes presented in this study, being both strategic and operational, I challenge the previously held assumption that organisations can opt for either strategic differentiation or operational efficiency strategies (Queiroz et al. 2018), arguing that both are necessary in the digital age. I recognise this as a higher-level capability of *ambidexterity* — the ability to engage in exploitation and exploration simultaneously. While ambidexterity has been associated with DT and digital platforms in the practitioner literature (Sebastian et al. 2017; Sia et al. 2021), this study may be the first to offer theoretical grounding to this concept in regards to DT through platformisation.

In this chapter I discussed the findings and the theorisation of this thesis in the context of the wider literature, highlighting its many implications for IS literature on digital platforms and DT. By considering DT through the lens of platformisation, I also contribute new insights to this emerging new stream of research. Next, I summarise the main contributions to theory and practice.

Chapter 8: Contributions

This chapter articulates my theoretical contributions, including contributions to the theory of coevolution, as well as contributions to practice. The significance and the timeliness of this topic is reflected in the growing number of contributions (Vial 2019; Hanelt et al. 2020; Nadkarni and Prügl 2020) and calls for papers across different disciplines (Bresciani et al. 2021b; Markus and Rowe 2021). With growing cognisance of the implications of digital platforms on DT, this thesis takes on the salient angle of platformisation and makes its contributions to this promising new area of research in information systems.

8.1 Theoretical Contributions

This research makes several theoretical contributions to the IS discipline. The first contribution lies in the theoretical model of DT through platformisation, synthesised from the empirical insights from three case studies and theorised using coevolution theory. This theorisation is the first of its kind, to the best of my knowledge, as it considers the interplay between the strategic and the digital platform levels in relation to their environment. To date, most theorisations on DT through platformisation have applied single-lens theoretical perspectives (Rolland 2021; Senyo et al. 2021; Vestues and Rolland 2021). This is a significant limitation, as DT is considered a complex process that reverberates across multiple levels (Hanelt et al. 2020). The application of coevolution theory, in that regard, provides a more holistic view of change. With this model I also contribute to the recently identified key focus areas of DT in the form of "contextual conditions, mechanisms and outcomes of DT" (Hanelt et al. 2020 p. 1161) by providing rich empirical insights regarding these aspects of DT through the angle of platformisation.

The second main contribution is the theoretical framework of mechanism of DT through platformisation, grouped into eight main categories. I also present a number of theoretical propositions derived from the mechanisms to better articulate my contribution. With this I contribute to a better understanding of the micro-foundations of the DT process (Vial 2019), as well as recent calls for research on DT, highlighting mechanisms as a viable way to present theory (Markus and Rowe 2021). The paucity of work on mechanisms has been stressed by scholars for a while (Besson and Rowe 2012). To the best of my knowledge, no prior study has produced such an extensive list of mechanisms or made attempts to categorise them in a meaningful way.

I extend the previous one-dimensional perspectives on mechanisms in the IS field — see for example (Henfridsson and Bygstad 2013; Huang et al. 2017) to a multilevel view, rooted in a coevolutionary dynamics. Coevolution takes into account the reciprocal changes between entities, rather than focusing on entities in isolation (Peppard and Breu 2003). The use of coevolution theory to address the micro-level mechanisms between the strategic and the digital platform levels is equally unique. No prior studies have applied the theory at this level, focusing instead on the general coevolution paradigm (Jovanovic et al. 2022), without delving into the intricacies this theory has to offer. The consideration of the macro-level effects on the micro-level adaptations is also a novel application of the coevolution theory (Volberda and Lewin 2003), often neglected in theorising. Furthermore, recent contributions applying the coevolutionary lens to DT have focused on IT systems in general and not digital platforms (Taj et al. 2021).

By accentuating mechanisms of DT through platformisation, this research builds on prior work that has predominantly focused on the mechanisms of DIs (Henfridsson and Bygstad 2013; Huang et al. 2017; Bygstad and Øvrelid 2020). Digital platforms in an organisational context are a different phenomenon to digital infrastructures explored by these studies, which are more

open and decentralised (Hanseth and Lyytinen 2010). They also focus on nascent industries and their scaling efforts, aspects not applicable to established organisations undergoing DT.

The third contribution are the three types of internal digital platforms articulated in this study. With this, I contribute to an ostensible gap in the literature, resulting from an over-emphasis on platform ecosystems. Recently articulated platform types focus on IoT platforms (Jovanovic et al. 2022). However, these types of platforms are architecturally different to enterprise platforms and operate in a different context (Pauli et al. 2021; Alt 2022). Our understanding of enterprise digital platforms has largely been limited to innovation (Gawer and Cusumano 2014; Sedera et al. 2016; Törmer 2018). Whilst I concur with this research, I also uncover two other types of internal digital platforms, beyond innovation alone. With this, I answer the question posed by de Reuver et al. (2017) on what types of digital platforms established organisations use.

This research contributes to both the streams of literature on DT and digital platforms, but also provides a novel contribution by combining the two. Synthesising insights from more than one literature domain can produce novel framings to problems. “Part of what makes such framings unique is not each individual stream, but the consideration of the different streams together” (Leidner 2020 p.241). Considering DT through platformisation is a salient angle in the light of the increasing significance of digital platforms in traditional industries. The existing literature on digital platforms, cannot be readily applied in the DT context as it is mainly focused on platform ecosystems and established platforms (Ghazawneh and Henfridsson 2013; Eaton et al. 2015). To that end, this research contributes to an understanding of how organisations can achieve DT by designing and evolving digital platforms, an under-explored area of research. I also answer the call by de Reuver et al. (2017) for expanding the scope of digital platform research and investigating how digital platforms emerge.

Lastly, DT in the chosen context — a university, provides a novel perspective to the DT literature, which has not explored the higher education sector to a great extent, beyond the learning and teaching context (Bygstad et al. 2022). Yet, the practitioner literature underscores the implications of DT for universities, transforming them from institutions to enterprises, keeping pace with the increasing demands of digitalisation (Yesner 2020). Indeed, to confer a competitive advantage in today’s world, universities world-wide are being compelled to undertake DT (Mohamed Hashim et al. 2022), which has been accelerated in the recent years (Garcez et al. 2022). Next, I review the contributions to the kernel theory of coevolution.

8.2 Contributions to Kernel Theory of Coevolution

This thesis also makes a contribution to the kernel theory of coevolution by proposing two new properties; *i) path alteration* and *ii) inverse requisite variety*. These two new properties have been observed in the given context of the study through the application of the coevolution theory. Further research is required to test their applicability in other contexts. The two new properties proposed are:

i) Path-alteration

The first proposed property is that of path alteration to supplement that of path-dependency. Coevolution theory stipulates that the adaptation is contingent on history and past, often irreversible decisions (Lewin and Volberda 1999; Rolland 2021). This can ultimately stifle the system’s ability to adapt (Hanseth and Lyytinen 2010). Therefore, I propose that *path-alteration* is required to forge new pathways that give the system alternative routes for adaptation. For example, at AU-U, the events of COVID-19 forced alternative pathways to be forged (e.g. conducting exams over an AI invigilation module). The university needed a new

direction (e.g. switching to a fully online mode of operation) to survive. However, some of the new pathways forged in this period were cemented and became a part of the new practices.

ii) Inverse requisite variety

The second proposed theory is that of inverse requisite variety, the opposite of requisite variety. According to Ashby's law of requisite variety the rate of internal change must meet or exceed the rate of external change for an organisation to survive (Vessey and Ward 2013). However, as observed in this thesis, if the need for internal change is greater than the rate of variety available in the external environment, this can stymie the coevolutionary process and act as a dampening mechanism. For example, in case Alpha it was observed that due to the very niche requirements of certain legacy systems, no adequate market alternative exists to replace them, and they continue to coexist alongside the digital platforms. This is an example of inverse requisite variety slowing down DT through platformisation. Having discussed the theoretical contributions, I now continue to reflect on the practical contributions of this thesis.

8.3 Contributions to Practice

This study also has implications for practice, as a timely and relevant phenomenon facing practitioners today. I contribute to the efforts of scholars in increasing practical relevance of IS research (Moeini et al. 2019). Firstly, this research provides rich empirical evidence from three cases, which can inform leaders in formulating DT programs, such as creating strategies and operating models for DT with digital platforms. By focusing on a phenomenon of interest to the practitioner community, this thesis, alongside collective contributions on DT can offer advice to leaders to improve their decision-making (Lucas Jr and Clemons 2013).

The topic of DT through platformisation provides a more nuanced view, recognising the increasing relevance of digital platforms in multiple industries. The three platform types articulated in this study are concrete examples of the types of digital platforms that can be built as part of DT efforts. This can inspire organisations to design digital platform types according to their own unique needs. Transforming organisations through digital platforms is a highly germane topic in today's world and one whose significance has been continually highlighted by the industry (Lansing 2021).

The findings reveal the emergence of different types of ecosystems as a result of DT through platformisation (internal and external). This can provide organisations with insights on how to leverage the power of digital platforms to organise internal stakeholders and external partners around a digital platform to co-create value, and grow and evolve dynamic ecosystems, adaptable to environmental demands. This contributes to the currently limited understanding of how and when established organisations on a DT path enter external ecosystems, and the influence of digital platforms on this process (Leijon et al. 2017). Moreover, it provides organisations with insights on how they can leverage internal ecosystems as a way to optimise their operational efficiency.

The mechanisms presented here can be tested and further refined in other organisational contexts and industries. The categories that make up the framework can inspire and guide conceptualising, planning and organising of DT programs. The detailed list of mechanisms provide concrete examples that can be leveraged in designing strategic initiatives. The articulated propositions based on the mechanisms provide actionable advice to leaders to help guide their decision-making. Moreover, in addition to stable contexts, the mechanisms observed in extreme contexts can guide leaders in formulating contingency plans for the future. Understanding how organisations can adapt to their environment swiftly to stay competitive amidst ongoing turbulence is now more important than ever before.

This research can provide guidance to universities and other enterprises and institutions with deeply ingrained traditional practices and norms, required to adapt in the digital age. I argue that the insights presented here are transferrable beyond their immediate context. In many ways, universities resemble other types of complex, multi-unit organisations and face some of the same challenges, such as a need to improve their operations and value propositions. Yet, universities are also arguably more complex than many other types of traditional organisations, faced with the challenge of balancing social responsibility and its own corporate goals (Ramos-Monge et al. 2017). As exemplified by the findings, not only are demographics and changing consumer expectations causing shifts in the market, but unforeseeable events (such as COVID-19) are exerting further pressure for organisations to adapt to a fast-changing environment. I now go on to discuss the limitations of this study and opportunities for future research.

Chapter 9: Limitations and Opportunities for Further Research

No research is ever exhaustive and this study is not without limitations. In this chapter, I reflect on these limitations, which provide opportunities for further research. Firstly, this study is bound to a single organisation, a university, although the insights reach beyond the learning and teaching context. While I readily acknowledge this limitation, I content that the theorisation offered by this thesis is grounded in rich empirical evidence from three case studies. I also argue that the insights are applicable beyond the immediate context.

Arguably, universities exhibit more complexity than some other types of traditional organisations, such as banks. Being both institutions, as well as enterprises, they are comprised of more heterogeneous stakeholders (e.g. students, academics, business and IT stakeholders and strategic partners). As exemplified by AU-U, universities are expanding the boundaries of value co-creation by collaborating with the industry, and are no longer confined to their traditional value propositions. In that regard, I argue that the insights presented in this thesis are transferrable to other contexts (e.g. other types of traditional organisations engaging in DT through platformisation). However, the question of transferability is ultimately determined by the reader who seeks to uncover relationships between the insights presented and their own experiences (Coghlan and Brydon-Miller 2014).

With AU-U being a large and complex organisation, three cases were sampled for practical reasons and for the purpose of completing this thesis. However, they do not depict the full reality of the university's DT though platformisation efforts, with a large number of digital initiatives unfolding continuously. In addition to the changes in the technical landscape, the organisation continues to transform its business processes, organisational structure and ways of working, which have not been explored in this study.

The second limitation pertains to the mechanisms of DT through platformisation. The mechanisms presented here, while extensive are not exhaustive. The analysis was data-intensive, due to the richness of the empirical data generated from the three cases. Moreover, the relationships between the mechanisms, and the mechanisms and organisational outcomes are outside the scope of this research, but present an interesting opportunity for future research. A new data set and a new theoretical lens will be required to explore this further.

Lastly, data collected during the times of COVID-19 inevitably placed limitations on the availability of subjects and site visits. This was mitigated by granted access to internal documents and the rich data collected during online interviews.

A number of possible further research avenues have been identified through this study. Future research could adopt positivism or critical realism for the purpose of testing and possibly extending the theoretical constructs presented here. Other organisational contexts could also be considered, including less established organisations and any specific challenges they might face.

To extend the theoretical model presented in this study, future research could consider the conditions under which certain mechanisms arise, as well as any other dampening mechanisms that may hider organisations in achieving DT through platformisation. In keeping with coevolution as the theoretical lens, researchers could explore other possible coevolving domains, such as governance or organisational structures, and how they coevolve with digital platforms. In a time marked by increasing turbulence, as exemplified by COVID-19, researchers can challenge the tenets of the punctuated equilibrium (PE) theory, employed for explaining organisational transformations in the past. According to this theory, periods of stability are marked by episodes of radical and infrequent change. As illustrated by the case of AU-U (platform Alpha) in times such as these, periods of radical change are more frequent (e.g. intervals in days or months, instead of years) and periods of stability shorter in duration.

With digital technologies, including digital platforms, displaying fundamentally different characteristics than technologies in the past, do we need to revisit our ontological assumptions about socio-technical systems? The transformative potential of digital technologies is far greater than other technological inventions in the past (Benbya et al. 2020). As digital technologies continue to take centre-stage, there is room for investigating a new ontological category, one of socio-digitality.

DT through platformisation also has possible implications for the topics of agility and alignment. As these topics reach maturity, novel insights are required in the form of new research directions and theoretical lenses (Tallon et al. 2019). While coevolution theory has been applied to studies of business-IT alignment (Benbya and McKelvey 2006b; Vessey and Ward 2013) in the past, future research could explore the effect of digital platforms on this process, as they are fundamentally different to the past generation of monolithic IT systems. Moreover, the alignment literature in the past has largely treated technology as secondary to strategy or focused on its supportive role in the organisation. DT is challenging these assumptions by bringing digital technology to the forefront for their ability to bring about change in a dynamic and agile way. This also brings the whole alignment paradigm into question. Under what conditions is the alignment paradigm still relevant? Are we moving beyond the alignment paradigm to one of a fusion between IT and business functions? Under what conditions is it not practical to merge these functions?

There is an opportunity to also re-examine the concept of agility in the light of new digital technologies. Typically in the past a distinction was held between strategic agility (Lior and Neumann 2007; Weber and Tarba 2014) and operational agility (Ter et al. 2018). Digital platforms are driving increasing convergence in organisations between different functions, giving rise to the concept of digital agility, proposed recently by Kovacevic-Opacic and Marjanovic (2021) and others (Salmela and Galliers 2022). Moreover, the extreme contexts ushered in by the COVID-19 pandemic call for a reconceptualsiation of the concept of agility, which has typically been explored in much more stable contexts in the past. The recent times have highlighted a need for a more rapid agility than previously envisaged, and actions that are often experimentational and improvisational (Kovacevic-Opacic and Marjanovic 2021; Kovacevic-Opacic and Marjanovic 2022).

Another salient topic to explore in greater detail, as a result of the pandemic is the effect of DT through platformisation on organisational resilience. Although studies have explored the role

of digital platforms on SMEs during COVID-19 (Mandviwalla and Flanagan 2021), as well as new ventures such as ride-sharing platforms (Ye et al. 2022), more research is required on the role digital platforms played in more established organisations. Future research could focus on other organisational contexts, to extend the university context of this study.

The proliferation of digital platforms in organisations also has implications for the architecture models employed to date. As traditional architectural frameworks such as EA lose relevance, future research could focus on developing new frameworks that are reflective of the dynamic nature of DT and digital platforms. Can existing models be adapted to reflect the more dynamic and malleable nature of digital platforms? How can organisations evaluate their digital maturity to help them determine their fitness and guide their future DT through platformisation endeavours?

More research is required on the organising logic of digital platforms in organisations — for example the trade-off between democratised and centralised architecture and governance structures. Does the assumption that digital platforms in an organisation are governed by a central architectural framework, which guides its evolution (Hanseth and Lyytinen 2010) need to be re-evaluated? Digital infrastructures, in contrast are believed to follow a more organic evolutionary path. Does this view still hold true, or is it more nuanced? What is the difference between digital platforms and digital infrastructures in the context of DT?

Also, as digital platforms grow, they generate complex dynamics that can manifest as paradoxical tensions. For instance, at AU-U a paradox was observed between a need to maintain standardised architectural practices through control, and allowing platform Beta autonomy over its evolution. These paradoxical tensions cannot be resolved and need to be managed. While prior research has considered the effect of these tensions on technology renewal through digital platform adoption (Wimelius et al. 2020), future research can examine how these tensions play out during platform design and how they are effectively managed. There is also an opportunity to contribute more to the topic of platform design during DT, in the form of design principles that can guide organisations engaging in the designing their own digital platforms.

DT through platformisation also calls for the revaluation of existing ISD approaches, even agile ones, as digitlal platform design invites more experimentation, improvisation and generic capability building, without always knowing how the parts will fit the whole design. The emergence of low-code platforms are empowerig users and non-techical staff to create business applications. The implications of these new trends in regards to DT through platformistion should be investigated further.

This chapter has highlighted some of the future research opportunities this study has identified. Whilst I acknowledge there are avenues other than platformisation available to practitioners for achieving DT, they are out of scope of this thesis. I now move onto my concluding remarks about this research.

Chapter 10: Conclusion

In this chapter, I reflect on the research undertaken in this thesis. I summarise the challenges current organisations are facing and the significance of undertaking DT through platformisation. I conclude with the key contributions to knowledge.

To begin with, today's organisations are subject to environments that are increasingly dynamic, often turbulent and marked by hyper-competition. Digital technologies are progressing at a staggering rate and presenting as both opportunities and threats for organisations. These technologies are heralding a new epoch of generativity and convergence, but with them comes greater complexity, that is more difficult to understand and manage.

Dealing with such complexity and uncertainty was challenging enough in the best of times. The recent pandemic-ridden times have brought in more extreme conditions and greater uncertainty, necessitating more rapid adaptation than ever before. Past logic no longer holds true, as organisations forge new strategic pathways and operating models to maintain resilience amidst high-velocity change. In fact, profitability and productivity have been relegated as secondary to business continuity and resilience. Digital technologies are now even more imperative as key differentiators of value. With this as the impetus, DT is gaining significant momentum, especially in traditional, established organisations.

For established organisations encumbered by complex systems and organisational structures, DT is posing as more of a challenge. This complexity, accumulated over a number of years can lead to inertia, which can be difficult to dissolve and become detrimental for organisations, stifling their ability to react to change. Indeed, many have experienced failed attempts at achieving this goal, costing them billions of dollars.

As DT continues to top managerial priorities for the near future, it is attracting increasing interest from both scholarship and practice. DT is a distinct phenomenon in its own right, motivated by change that is more transformational than any other type of organisational change explored in the past. It can lead to radical changes, such as new business models and organisational forms, as well as fundamentally alter the way organisations operate and organise their resources by absorbing digital technologies.

Digital platforms are paving the way for DT as they continue to proliferate organisations and the society at large. Indeed, platform organisations are amongst the top-performing organisations in the world. Yet, increasingly platform thinking is being applied even in conventional industries to transform organisations and make them more competent for the digital age. The benefits of platformisation as an instrument in realising DT is gaining fast recognition, as exemplified by this research.

No industry is truly exempt from the implications of DT and digital platforms, including the higher education sector. With changing student-consumer expectations, indicative of the wider societal shifts driven by digitalisation, and the rise of online learning platforms, leveraging digital platforms for DT becomes a key concern for universities. This study provided an example of a university motivated to improve its operations and redefine its value propositions to remain competitive.

This thesis makes a contribution to scholarship, as well as practice on the emerging, yet burgeoning topic of DT through platformisation. The theoretical contributions include a theoretical model, a theoretical framework of mechanism of DT through platformisation and a

set of theoretical propositions. In this research, I contribute to the body of literature on digital platforms by articulating three types of internal digital platforms, as well as to DT literature, but I also provide a unique contribution by combining the two. This thesis also contributes to the kernel theory of coevolution in the form of two new properties – *path alteration* and *inverse requisite variety*.

This research also makes a number of contributions to practice. Although conducted in a university setting, I argue that the insights presented here are not idiosyncratic to universities and therefore transferrable beyond their immediate context. In addition to providing rich insights from three case studies, it can also help to inform practitioners on how to develop DT programs, such as creating strategies and operating models for DT with digital platforms. It can offer guidance on how to design internal digital platforms as part of DT, as well as ecosystems, both internal and external. The mechanisms presented in this thesis can be tested and refined in other organisational contexts and industries. The theoretical framework can assist in the coordination of resources for DT programs. Moreover, the theoretical propositions can aid leaders in their decision-making processes. The insights presented in this thesis cater for both the more stable contexts, as well as extreme contexts. The challenges and the motivation to pursue a DT through platformisation trajectory is reflected in the reality of many large, established organisations today, making it a highly relevant topic to advance further.

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Appendix A: Indicative Interview Questions

About the Role

1. What is your role and involvement on the digital platform/ project?

About the digital platform

2. Can you describe the digital platform from your own perspective?
3. When was the platform launched?

Digital platform strategy

4. Please describe the digital platform strategy or equivalent.
5. Can you describe how the strategy was formulated?
    a. Was it in response to organisational strategy, or was it done independently?
6. How are decisions about the digital platform strategy made?

Digital platform architecture

7. Can you describe what the digital platform offered when launched?
    a. What was the initial number of modules the digital platform started with?
8. How often do you add new modules?
    a. How are they added?

Mutual shaping between strategy and digital platform

9. Can you recall how the addition or modification of modules or any other changes on the digital platform have led to a change in the strategy?
10. Can you describe any changes in strategy that have led to a change in the digital platform's modules or any other changes on the digital platform?
11. What triggered these changes? (e.g. students' needs, strategy, external factors)?
12. What other aspects enable or hinder this mutual shaping between strategy and the digital platform?

Appendix B: Ethics Approval

Date: 5/4/2020

To: Lana Kovacevic-Opacic

From: research.ethics@uts.edu.au

Subject: Your ethics application has been approved as low risk - ETH20-4690

Dear Applicant,

Re: ETH20-4690 - "The coevolution of digital platform strategy and digital platform architecture"

Your local research office has reviewed your application and agreed that it now meets the requirements of the National Statement on Ethical Conduct in Human Research (2007) and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application, subject to any conditions detailed in this document. You are reminded that this letter constitutes ethics approval only. This research project must also be undertaken in accordance with all UTS policies and guidelines including the Research Management Policy.

Your approval number is UTS HREC REF NO. ETH20-4690. Approval will be for a period of five (5) years from the date of this correspondence subject to the submission of annual progress reports.

The following standard conditions apply to your approval:

- Your approval number must be included in all participant material and advertisements.
- Any advertisements on Staff Connect without an approval number will be removed.
- The Principal Investigator will immediately report anything that might warrant review of ethical approval of the project to the Ethics Secretariat (Research.Ethics@uts.edu.au).
- The Principal Investigator will notify the UTS HREC of any event that requires a modification to the protocol or other project documents, and submit any required amendments prior to implementation. Instructions on how to submit an amendment application can be found here.
- The Principal Investigator will promptly report adverse events to the Ethics Secretariat. An adverse event is any event (anticipated or otherwise) that has a negative impact on participants, researchers or the reputation of the University. Adverse events can also include privacy breaches, loss of data and damage to property.
- The Principal Investigator will report to the UTS HREC annually and notify the HREC when the project is completed at all sites.
- The Principal Investigator will notify the UTS HREC of any plan to extend the duration of the project past the approval period listed above through the progress report.
- The Principal Investigator will obtain any additional approvals or authorisations as required (e.g. from other ethics committees, collaborating institutions, supporting organisations).
- The Principal Investigator will notify the UTS HREC of his or her inability to continue as Principal Investigator including the name of and contact information for a replacement.

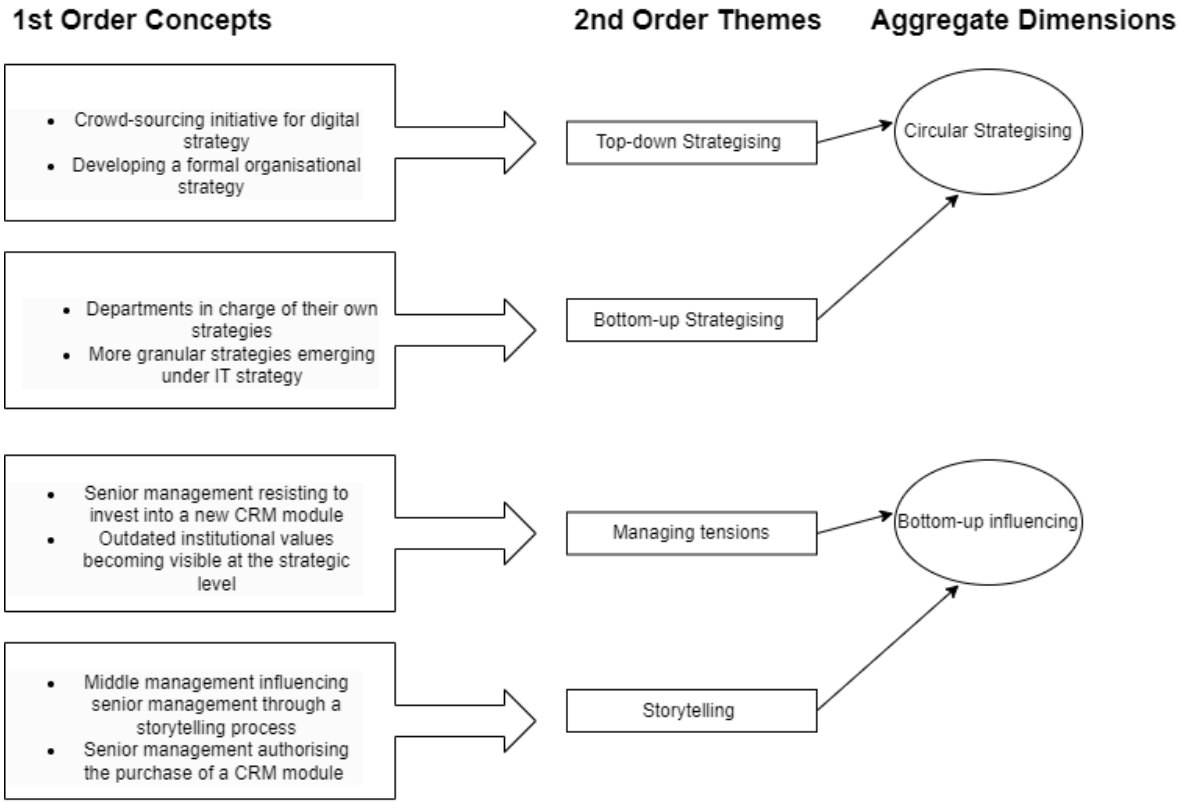
This research must be undertaken in compliance with the Australian Code for the Responsible Conduct of Research and National Statement on Ethical Conduct in Human Research.

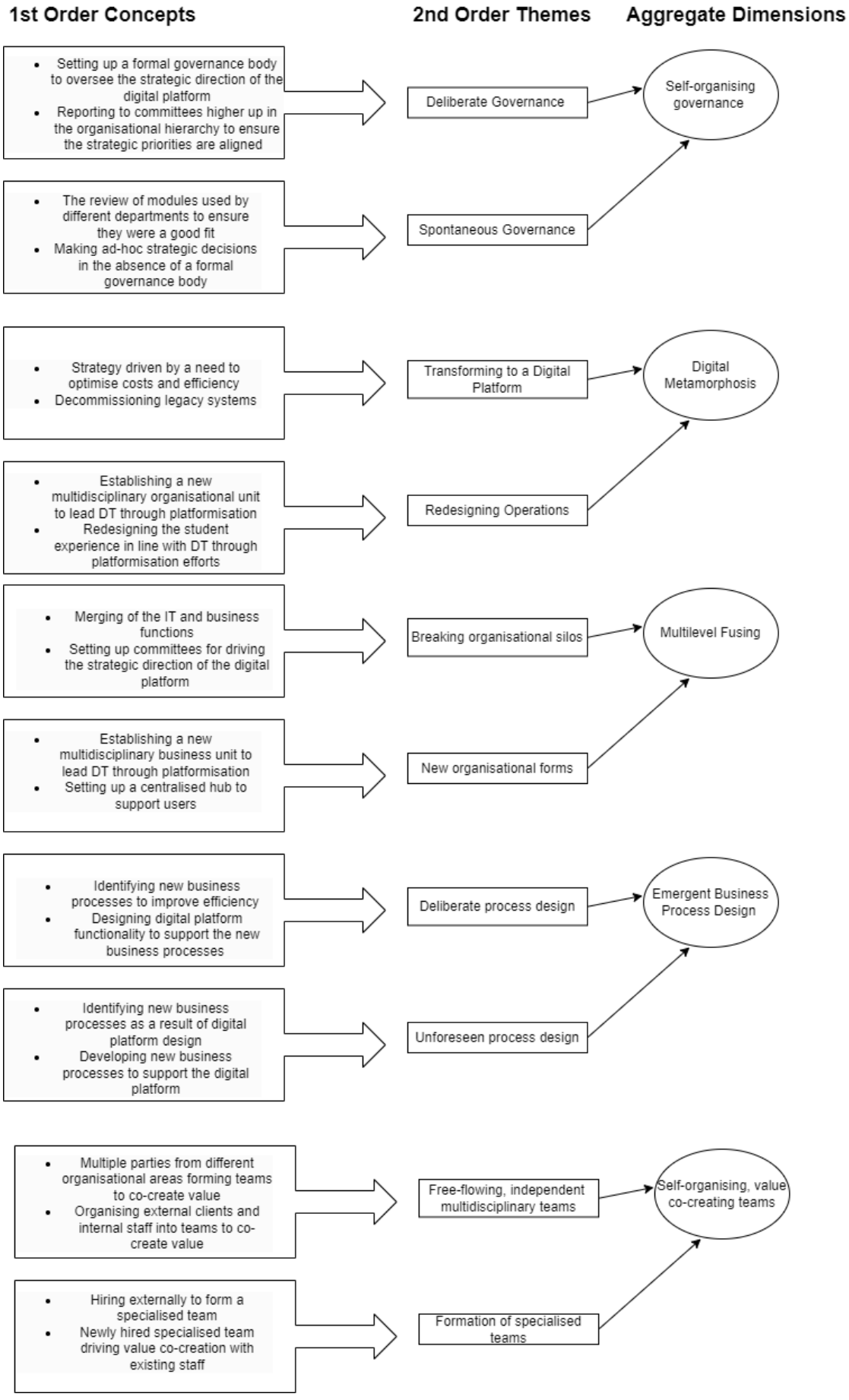
You should consider this your official letter of approval.

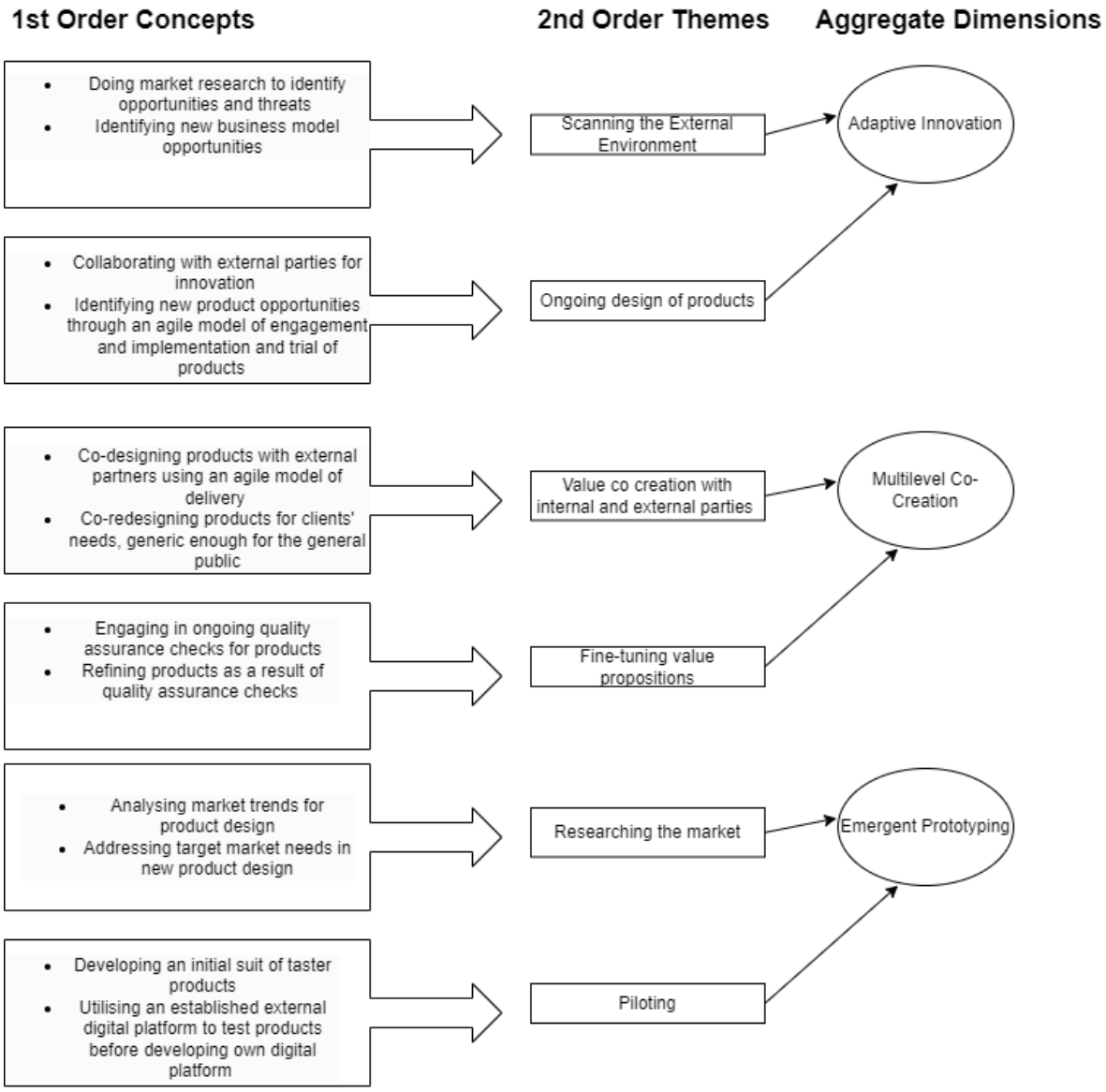
If you have any queries about this approval, or require any amendments to your approval in future, please do not hesitate to contact your local research office or the Ethics Secretariat.

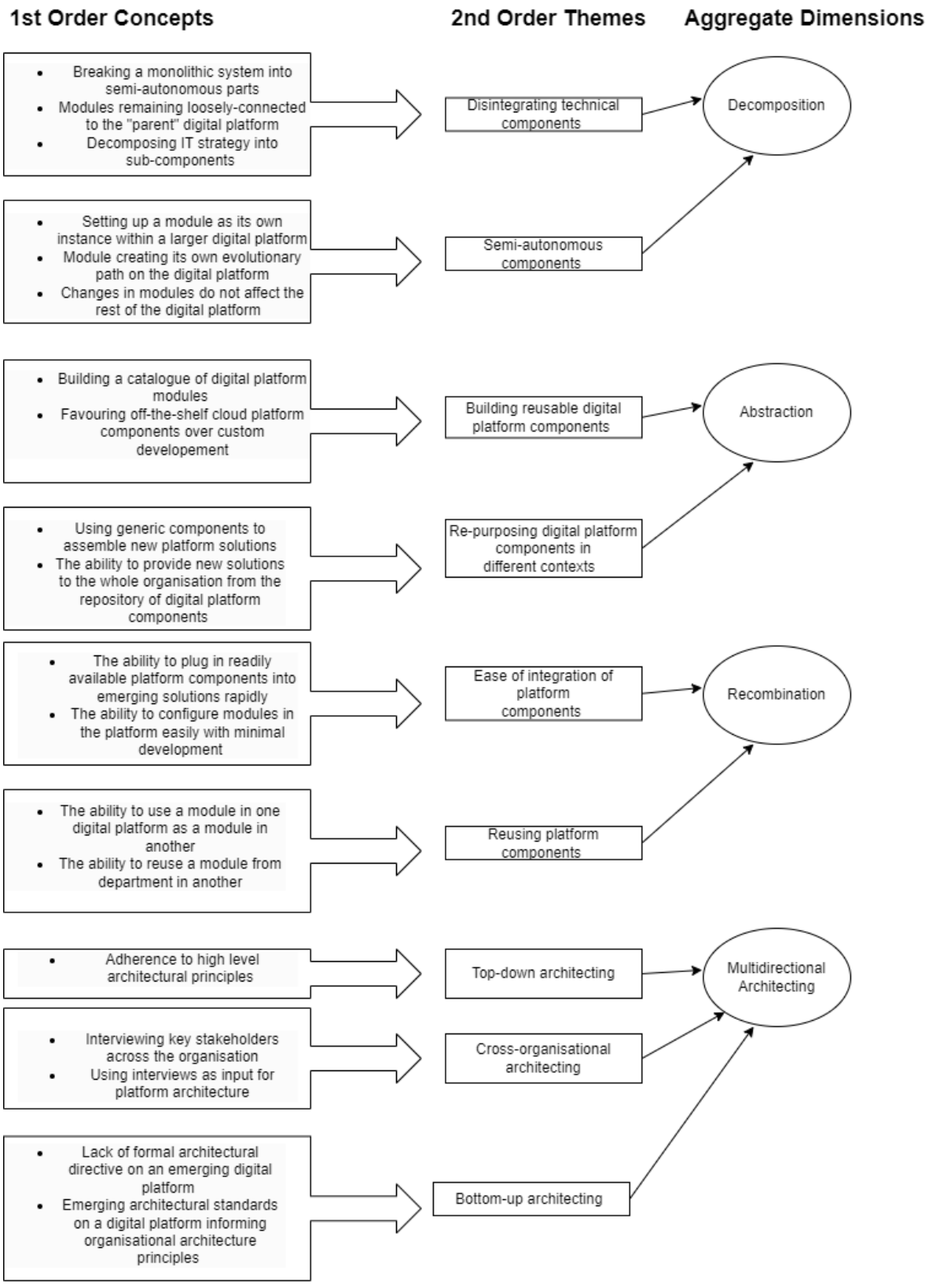
Appendix C: Data Structure

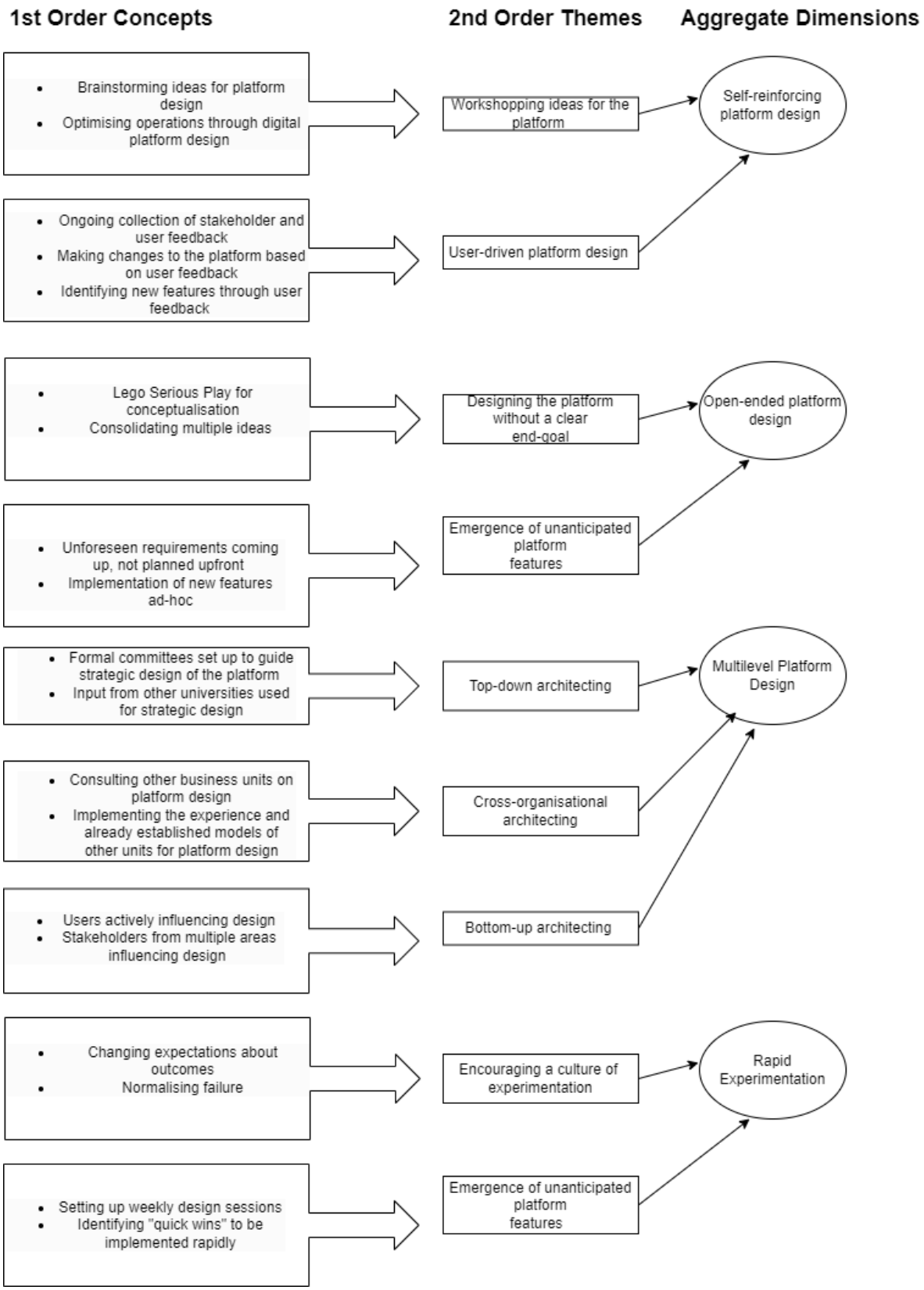
The following data structure has been adopted from (Gioia et al. 2012) and (Corley and Gioia 2004).

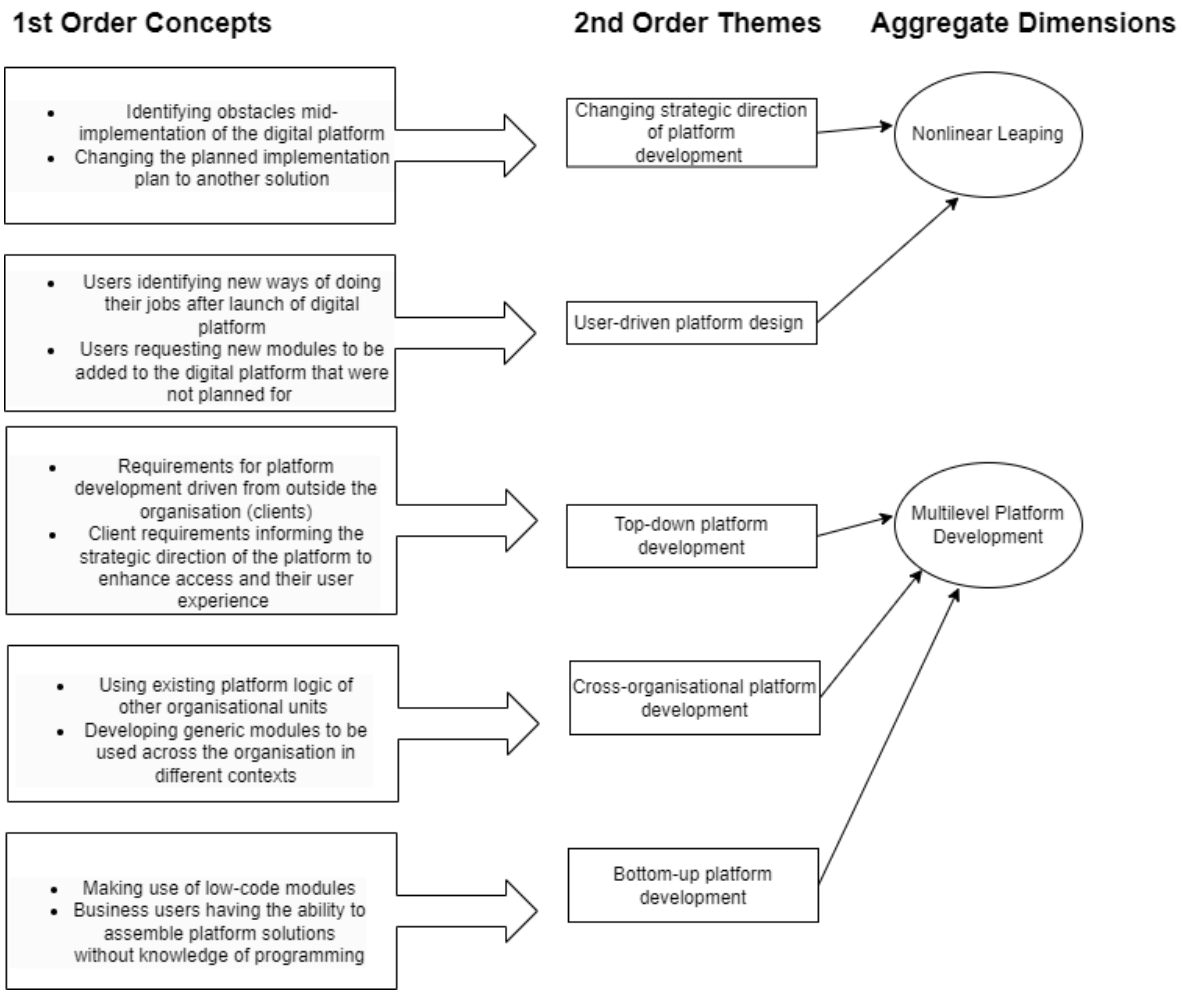


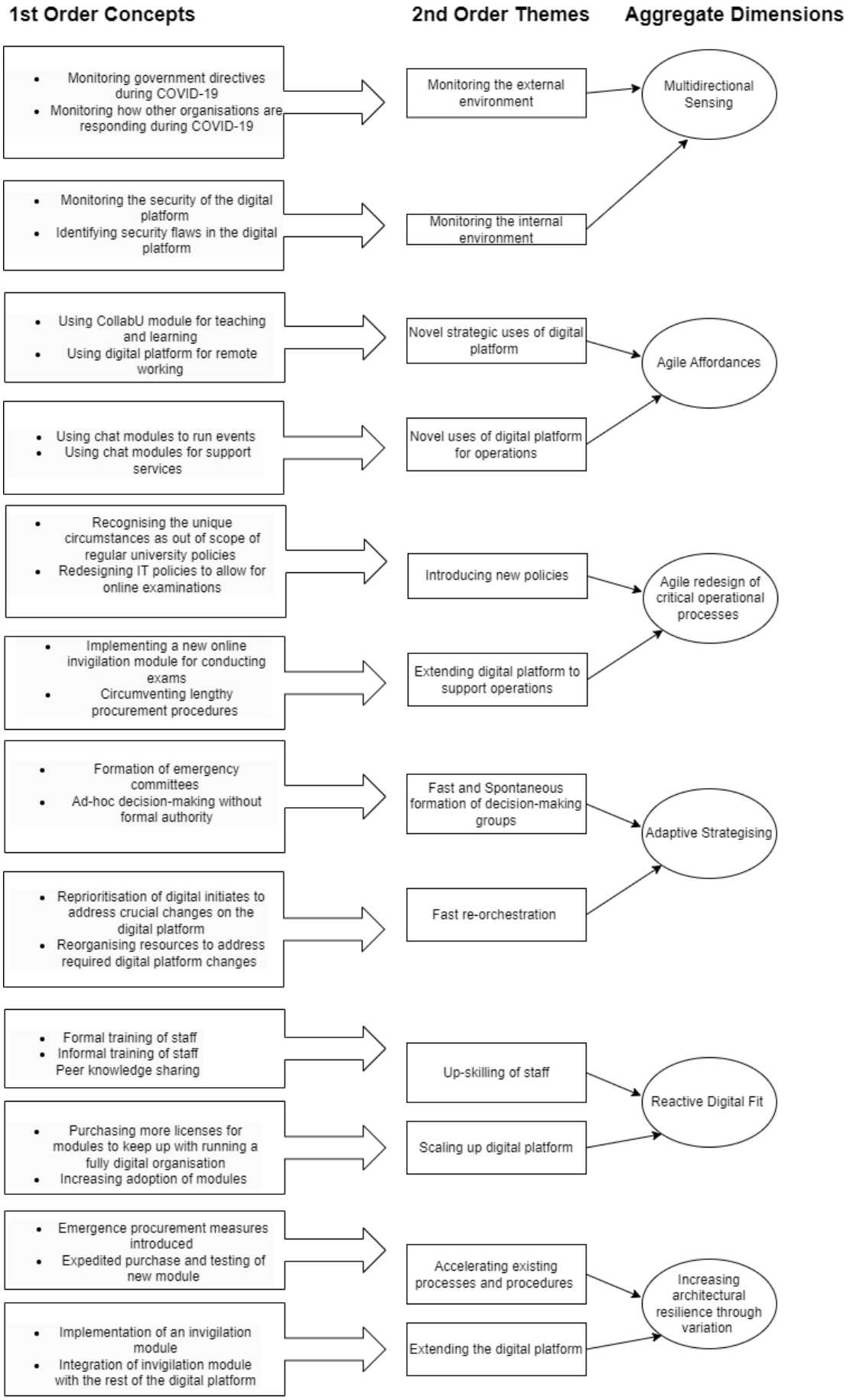

1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Setting up a formal governance body to oversee the strategic direction of the digital platform
Reporting to committees higher up in the organisational hierarchy to ensure the strategic priorities are aligned
Deliberate Governance
Self-organising governance
The review of modules used by different departments to ensure they were a good fit
Making ad-hoc strategic decisions in the absence of a formal governance body
Spontaneous Governance
Strategy driven by a need to optimise costs and efficiency
Decommissioning legacy systems
Transforming to a Digital Platform
Digital Metamorphosis
Establishing a new multidisciplinary organisational unit to lead DT through platformisation
Redesigning the student experience in line with DT through platformisation efforts
Redesigning Operations
Merging of the IT and business functions
Setting up committees for driving the strategic direction of the digital platform
Breaking organisational silos
Multilevel Fusing
Establishing a new multidisciplinary business unit to lead DT through platformisation
Setting up a centralised hub to support users
New organisational forms
Identifying new business processes to improve efficiency
Designing digital platform functionality to support the new business processes
Deliberate process design
Emergent Business Process Design
Identifying new business processes as a result of digital platform design
Developing new business processes to support the digital platform
Unforeseen process design
Multiple parties from different organisational areas forming teams to co-create value
Organising external clients and internal staff into teams to co-create value
Free-flowing, independent multidisciplinary teams
Self-organising, value co-creating teams
Hiring externally to form a specialised team
Newly hired specialised team driving value co-creation with existing staff
Formation of specialised teams

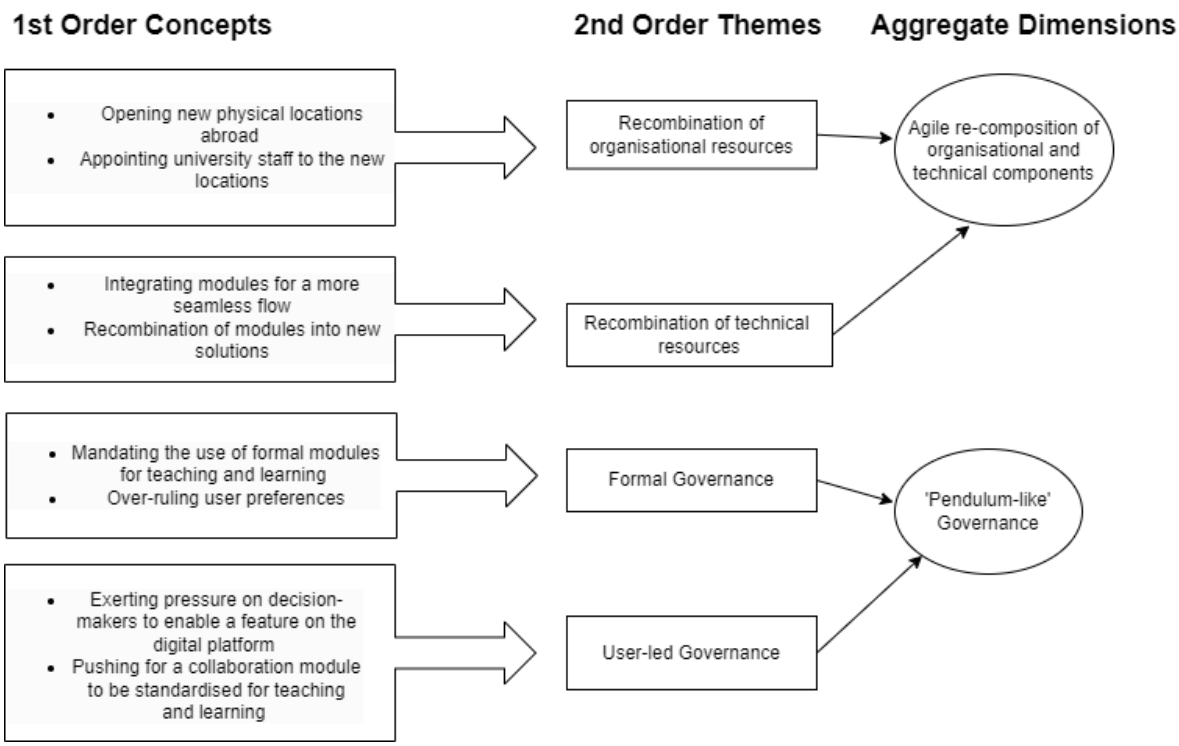

1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Doing market research to identify opportunities and threats
Identifying new business model opportunities
Scanning the External Environment
Adaptive Innovation
Collaborating with external parties for innovation
Identifying new product opportunities through an agile model of engagement and implementation and trial of products
Ongoing design of products
Co-designing products with external partners using an agile model of delivery
Co-redesigning products for clients' needs, generic enough for the general public
Value co creation with internal and external parties
Multilevel Co-Creation
Engaging in ongoing quality assurance checks for products
Refining products as a result of quality assurance checks
Fine-tuning value propositions
Analysing market trends for product design
Addressing target market needs in new product design
Researching the market
Emergent Prototyping
Developing an initial suit of taster products
Utilising an established external digital platform to test products before developing own digital platform
Piloting


1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Breaking a monolithic system into semi-autonomous parts
Modules remaining loosely-connected to the "parent" digital platform
Decomposing IT strategy into sub-components
Disintegrating technical components
Decomposition
Setting up a module as its own instance within a larger digital platform
Module creating its own evolutionary path on the digital platform
Changes in modules do not affect the rest of the digital platform
Semi-autonomous components
Building a catalogue of digital platform modules
Favouring off-the-shelf cloud platform components over custom developement
Building reusable digital platform components
Abstraction
Using generic components to assemble new platform solutions
The ability to provide new solutions to the whole organisation from the repository of digital platform components
Re-purposing digital platform components in different contexts
The ability to plug in readily available platform components into emerging solutions rapidly
The ability to configure modules in the platform easily with minimal development
Ease of integration of platform components
Recombination
The ability to use a module in one digital platform as a module in another
The ability to reuse a module from department in another
Reusing platform components
Adherence to high level architectural principles
Top-down architecting
Multidirectional Architecting
Interviewing key stakeholders across the organisation
Using interviews as input for platform architecture
Cross-organisational architecting
Lack of formal architectural directive on an emerging digital platform
Emerging architectural standards on a digital platform informing organisational architecture principles
Bottom-up architecting


1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Brainstorming ideas for platform design
Optimising operations through digital platform design
Workshopping ideas for the platform
Self-reinforcing platform design
Ongoing collection of stakeholder and user feedback
Making changes to the platform based on user feedback
Identifying new features through user feedback
User-driven platform design
Lego Serious Play for conceptualisation
Consolidating multiple ideas
Designing the platform without a clear end-goal
Open-ended platform design
Unforeseen requirements coming up, not planned upfront
Implementation of new features ad-hoc
Emergence of unanticipated platform features
Formal committees set up to guide strategic design of the platform
Input from other universities used for strategic design
Top-down architecting
Multilevel Platform Design
Consulting other business units on platform design
Implementing the experience and already established models of other units for platform design
Cross-organisational architecting
Users actively influencing design
Stakeholders from multiple areas influencing design
Bottom-up architecting
Changing expectations about outcomes
Normalising failure
Encouraging a culture of experimentation
Rapid Experimentation
Setting up weekly design sessions
Identifying "quick wins" to be implemented rapidly
Emergence of unanticipated platform features


1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Identifying obstacles mid-implementation of the digital platform
Changing the planned implementation plan to another solution
Changing strategic direction of platform development
Nonlinear Leaping
Users identifying new ways of doing their jobs after launch of digital platform
Users requesting new modules to be added to the digital platform that were not planned for
User-driven platform design
Requirements for platform development driven from outside the organisation (clients)
Client requirements informing the strategic direction of the platform to enhance access and their user experience
Top-down platform development
Multilevel Platform Development
Using existing platform logic of other organisational units
Developing generic modules to be used across the organisation in different contexts
Cross-organisational platform development
Making use of low-code modules
Business users having the ability to assemble platform solutions without knowledge of programming
Bottom-up platform development


1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Monitoring government directives during COVID-19
Monitoring how other organisations are responding during COVID-19
Monitoring the external environment
Multidirectional Sensing
Monitoring the security of the digital platform
Identifying security flaws in the digital platform
Monitoring the internal environment
Using CollabU module for teaching and learning
Using digital platform for remote working
Novel strategic uses of digital platform
Agile Affordances
Using chat modules to run events
Using chat modules for support services
Novel uses of digital platform for operations
Recognising the unique circumstances as out of scope of regular university policies
Redesigning IT policies to allow for online examinations
Introducing new policies
Agile redesign of critical operational processes
Implementing a new online invigilation module for conducting exams
Circumventing lengthy procurement procedures
Extending digital platform to support operations
Formation of emergency committees
Ad-hoc decision-making without formal authority
Fast and Spontaneous formation of decision-making groups
Adaptive Strategising
Reprioritisation of digital initiates to address crucial changes on the digital platform
Reorganising resources to address required digital platform changes
Fast re-orchestration
Formal training of staff
Informal training of staff
Peer knowledge sharing
Up-skilling of staff
Reactive Digital Fit
Purchasing more licenses for modules to keep up with running a fully digital organisation
Increasing adoption of modules
Scaling up digital platform
Emergence procurement measures introduced
Expedited purchase and testing of new module
Accelerating existing processes and procedures
Increasing architectural resilience through variation
Implementation of an invigilation module
Integration of invigilation module with the rest of the digital platform
Extending the digital platform


1st Order Concepts
2nd Order Themes
Aggregate Dimensions
Opening new physical locations abroad
Appointing university staff to the new locations
Recombination of organisational resources
Agile re-composition of organisational and technical components
Integrating modules for a more seamless flow
Recombination of modules into new solutions
Recombination of technical resources
Mandating the use of formal modules for teaching and learning
Over-ruling user preferences
Formal Governance
'Pendulum-like' Governance
Exerting pressure on decision-makers to enable a feature on the digital platform
Pushing for a collaboration module to be standardised for teaching and learning
User-led Governance

Appendix D: Sample Coding Extracts

D.1 Strategising Mechanisms

Open coding Strategic level	 Digital platform level	Axial coding	Aggregate Dimensions	Coevolution Properties
Organisational strategy formulation Example quote: *"So two years ago, they did the crowdsourcing initiative and essentially came up with [the organisational strategy]"— Platforms Manager*	Departments influencing organisational strategy Example quote: *"So we kind of had to step back and think well the course led approach that you're advocating for how to do this doesn't work for our faculty. Then it went back up, came back down. And now we're finding that we have a lot of opportunity to feed back up. So they've been quite receptive. We're caring out feedback sessions with staff. So while I think initially, like any strategy, top down. I think there has been opportunities to feed back and adapt." – Member of the academic staff (user)*	Top-down strategising and Bottom-up strategising	Circular strategising	Multi-directional and Multilevel effects, Positive feedback loop
Senior management resisting to invest into a new CRM module. Example quote: *"It started there, we recognised the university wasn't ready for such terminology as enterprise CRM" – Head of Platforms*	The influencing of senior management by middle-management resulting in the eventual procurement of a CRM module. Example quote: *"With a lot of consultation, pragmatism, it's ongoing storytelling process." Head of Platforms*	Managing tensions and Storytelling	Bottom-up influencing	Multilevel, Multidirectional effects and Genetic fixing

D.2 Digital Organising Mechanisms

Open coding Strategic level	Digital platform level	Axial coding	Aggregate Dimensions	Coevolution Properties
Planned governance Example quote: *"I'm trying to put that governance body together […]. What we [..] procure, implement is going to have to be driven by the governing body and we're just in the process of putting that together at the moment in terms of the terms of use, the roles and responsibilities of key individuals or key [aspects] in the decision making processes" – Technical Manager*	Improvisational governance Example quote: *"At the moment there's kind of an interim governance board, it's hard to describe it because the [DT] program board is responsible for kind of endorsing the direction of […] the technology ecosystem. So we do regular updates to them about what's happening and get their advice on particular issues" – Head of Operations*	Deliberate governance and Spontaneous governance	Self-organising governance	Self-organisation, Emergence, Multidirectional effects
Need to optimise costs Example quote: *"We ended up looking at [HighEd-M] for our postgrad and having two [systems] and paying two massive licensing fees was very quickly looked at by the higher up. […] We're moving to*	Digital platform influencing a redesign of the student experience Example quote: *"As platforms become easier to use, the learning designer role changes from enabling the "doing" and the use of the platforms, towards advising and even questioning teachers in the way that they*	Transforming to a Digital Platform and Redesigning Operations	Digital Metamorphosis	Adaptive tensions

[HighEd-M] now for all teaching. " Analyst/Programmer	*use the platforms to enable learning. A list of content is no longer sufficient preparation. One needs to think of how students will interact with that content and how they will produce evidence that they can use that content to solve problems and to demonstrate a shift in their own consciousness." — Member of the academic staff (user)*			
Digital strategy driving the restructuring of business and IT Example quote: *"A part of that digital strategy is what we call a [governance model] – how does the university govern our digital journey? The way that we've proposed that and I think it's been broadly accepted is that each domain has a [governance board]. So there's a senior business stakeholder rather than an IT person. The IT person partners with that business stakeholder to figure out what the plans are for each domain and then we meet every quarter to review progress, replan for future and govern that path forward. That didn't exist*	New level emerging connecting IT and business at the digital platform level Example quote: "*[…] which gives us [TransformationHub] a little more decision making authority on behalf of the business, so it becomes a true collaboration between the business and [IT department]" — Technical Manager*	Breaking organisational silos and New organisational forms	Multilevel Fusing	Emergence

before" – Senior Enterprise Architect				
Creating new processes as a result of the new platform Example quote: *"All along we've had to create new processes to get this done, because we're the first. [...]." – Product Owner 1*	A need for new business processes emerging as a result of design Example quotes: *"What the struggle is, even though we've build that there isn't an official business process behind it" – Change Manager* *"So one of the things about the [Platform Beta], you can't really automate anything if you don't have a manual business process to support that, like an as-is process." – Senior Project Manager*	Deliberate process design and Unforeseen process design	Emergent business process design	Emergence, Multilevel effects
Forming a steering group from different organisational units Example quote *"We established very early on a [steering group] […], where we identified the key people within the faculties who were driving postgraduate education" — Strategy Analyst*	Forming dedicated teams to jointly co-create value Example quote *"It was all external, so we hired a whole new team. We created a team from scratch. […]We had to build a studio and had to get in a whole lot of resource to enable that all to happen. […].They're the frontline people working with the academics to kind of work on new products. " — Strategy Analyst*	Free-flowing, independent multidisciplinary teams and Formation of Specialised Teams	Self-organising, value-co creating teams	Self-organisation

D.3 Innovation Mechanisms

Open coding Strategic level	Digital platform level	Axial coding	Aggregate Dimensions	Coevolution Properties
Readjusting product strategy Example quote: *"The overall postgraduate strategy was launched because we were looking at falling domestic enrolments for post graduate education. This was to look at doing something different with post graduate education really kind of reimagining what that could be. A lot of that data was telling us that people were looking for increased flexibility. Postgraduate offerings is a very crowded market, looking at learning in smaller chunks. Students were looking for greater flexibility with their courses […]. There's still a huge value for master's degrees, more traditional*	New requirements emerging, leading to further innovation Example quote: *"They've now realised that actually we need some pre-learning. So, we're looking at now developing another course for [partner]. […].We're looking at two more so as part of that, kind of process of constant feedback, they've now identified: well, actually, there's these other things we need as well that would help our people so it's been able to enable us to go oh, well, let's, let's build some more product that helps you to have a better experience" — Industry Collaboration Manager*	Scanning External Environment and Ongoing design of products	Adaptive innovation	Requisite variety, Genetic fixing

types of learning."— Strategy Analyst				
Targeted but generic product design Example quote: *"The very important part of that process was that [client organisation] didn't want really and we also didn't want to have micros that will be [client organisation] specific. We didn't want to build something that will be bespoke product for [client organisation]. From the beginning we wanted to build micro-credentials that can be offered to the public as well and to other companies and [client organisation] was very happy with that, and they also didn't want something that would be [client organisation] specific." — Deputy Head of School*	Collaborating through platforms to deliver value on the platform Example quote: *"We typically meet on [ChatU] or [CollabU] actually, and with the academics, so to co-create the learning. We bring the subject matter experts in from our side and the subject matter experts from [client organisation] and they basically explore the problem, and our subject matter experts and academics go away and design a framework of what they think the cost might look like. They then run that past [client organisation] and then it's kind of back and forth as they're developing the course materials. […] I think they just use [CollabU] to then, we deliver the content in [High-Ed M] — Industry Collaboration Manager*	Co-creating value with partners	Multilevel co-creation	Multilevel, Emergence
Initiating the design of a platform based on the external market Example quote:	Setting up an interim solution on an external digital platform *[External consultant], "so they just provided an interim solution – […] for us to initially roll out*	Researching the Market and Piloting	Emergent Prototyping	Multilevel effects, Emergence

"The research was telling us the market was looking for a far more flexible offering which was really the rationale for looking at how we could enable that, enable a more digitally enhanced learning".— Strategy Analyst	*the digital platform with some initial suite of tasters. It never meant to be a permanent solution" —Strategy Analyst*			

D.4 Digital Platform Architecture Mechanisms

Open coding **Strategic level**	**Digital platform level**	**Axial coding**	**Aggregate Dimensions**	**Theoretical coding**
Disintegration IT strategy into sub-components Example quote: *"We haven't had a formal digital working strategy before. We've had [IT] strategies but we haven't gone down to that next level of having domain strategies" — Senior Enterprise Architect*	Setting up Platform Beta core as a semi-autonomous instance within AU-U CMS. Example quote: *"During the [Platform Beta] project one of the things that we did is we were moving it from a monolith [CMS] instance into a new [CMS] multi-tenanted solution. So multitenanted means that we were actually modularising the [AU-U platform] because [Platform Beta] […]. By putting it onto multitenancy [modules], could have their own configuration and control and evolution without having to completely retest the whole [platform] — Senior Enterprise Architect*	Disintegrating social and technical components and Semi-autonomous components	Decomposition	Decomposition

Reusing platform components easily Example quote: *"So in future we hoped if someone comes along and says this is what we want to do, we want to be able to say: "[…]just use this one here" as a micro-project or a business as usual project to make this accessible for this particular [platform or module]. […]The different areas could learn off each other. If let's say [a department] decided they wanted this, […] it's now available and we can set it up in a couple of weeks." — Senior Enterprise Architect*	Building a catalogue of generic platform modules Example quote: *"We're trying to avoid changes that are specific for a particular application and we're trying to build these "build once use many times". The problem is we haven't got a suite of these "use many times yet". That's what we want to build. " — Senior Enterprise Architect*	Building reusable digital platform components and Re-purposing digital platform components in different contexts	Abstraction	Modularity
Strategy driving reuse of components at the digital platform level Example quote: *"We used [Events management] because it was the platform that was the designated enterprise event management [module]. We used [CMS] because it was the designated platform. There wasn't really any options for any other*	Emergent reuse of components unforeseen by the strategic level Example quote "The only thing that has been added is the feedback widget. […]It was an addition of something that didn't exist before. [] It wasn't originally a part of the build." — Change manager	Ease of integration of platform components and Reusing platform components	Recombination	Modularity

platforms to be considered. It was driven by the strategic decision that they are at the time the platforms you would use. We also have and this is driven through the solution design centre, the architectural principles and they drive the way that we architect in terms of the reuse of existing systems, the way that we integrate between systems, the use of single sign-on. [Platform Beta] […], We have to do an assessment of the architecture against those principles and justify and explain any deviations from those principles"— Senior Enterprise Architect				
Architectural principles and standards from the Central Architectural Board enforced for the development of platforms. Example quote: *"[Platform Beta] like any other project […] has to adhere to these architecture principles and the standards." – Technical Lead* Cross-organisational strategising Example quite:	During work on personalisation for Platform Beta emergent requirements came up that would feed into AU-U architectural principles and standards. Example quote: *"We had an alignment meeting with the solution designer who's working on this and he specifically said he doesn't have enough framework to give us guidance, but he's involved in everything we do. He can learn from what we're doing and also make sure if something does come up how he can grandfather that back in" – Senior Project Manager*	Top-down, bottom-up and cross-organisational architecting	Multidirectional architecting	Multidirectional effects

"We went out and we did I think 70 interviews across the whole of [the university] asking what people saw as the key strategic drivers of change for the university, how digital might help us achieve a digital vision for the university and what the priorities were in each of their areas and we co-designed the digital strategy with business stakeholders and also a lot of the people within [IT department] as well" – Senior Enterprise Architect				

D.5 Digital Platform Design Mechanisms

Open coding **Strategic level**	**Digital platform level**	**Axial coding**	**Aggregate Dimensions**	**Theoretical coding**
Collecting feedback formally and informally from different stakeholder groups within the university after each iteration of the platform Example quote: *"The feedback will come through all sorts of different mechanisms. There will be informal feedback we hear from talking to groups of*	Implementing the feedback in future iterations of the platform Example quote: *"So this is really key for the strategy to work, because so far it's been opinions based on stakeholders and influences. Now we can start getting feedback from the users or what is valuable to them" — Senior Project Manager*	Workshopping ideas for the platform and User-driven platform design	Self-reinforcing platform design	Positive feedback

people around the university, the feedback that we get through various committees through going out and doing interventions with groups of people designed to get that feedback. Through other mechanisms – there'll probably be a whole range of different things we'd use to get the feedback" — Product Owner 1				
Designing without a clear end-goal Example quote: *"The trouble with what we're trying to do is, is not in any way shape, or form a standard [IT] type project, because at the outset, although we have high level design principles, we actually don't know what we're going to build." Product owner 1* *Lego Serious Play* *"It's a really good way to help people visualise what they think they need in the future, what they have today, and how they can connect to anyone else, and what the future could look like. […] Lego works better than words, in many ways, it helps people to sort of articulate what they think they're trying to get out of the whole tool*	Collaboration with IT and business Example quotes: *"The critical thing there is the strategic partnership between the two halves. Between the business side and the solution side. What's important in that strategic relationship is understanding because both sides speak different languages. You need to have a translator that can work between the two and translate. And secondly, you need on both sides a willingness to explore the problems in an open ended way"* — Product owner 1 "*So you need to be able to set up environments where to where the business and the solution provider can work together in a collaborative form to explore problems in a collaborative way, without there ever being a clear driver for one side or the other. So you have a, you have more of an open forum where each person is there. They're bringing their own particular*	Designing the platform without a clear end-goal and Emergence of unanticipated platform features	Open-ended platform design	Nonlinearity and Emergence

or the system" – Senior Project Manager.	*expertise to the conversation. But the group as a whole try to explore the problem in a very open way" — Product owner 1*			
External and internal advisers influencing strategic design Example quote: *"It was covering a number of different areas. We got an external facilitator in to drive the strategic workshops, and then a specialised human-centred design person then to work closely in doing human-centered design work with the key stakeholders within each of these strategic opportunities that we identified" — Program Manager*	Considering already established models of other organisational units in design *"There was a discussion of how we're going to integrate more [HighEd-M] modules into [Platform Beta] and we had a meeting to explore how [Platform Gamma] is functioning, so that we can take an adapt this model to [Platform Beta]" — Business Analyst*	Top down, cross-organisational and bottom-up platform design	Multilevel platform design	Multilevel and Multidirectional effects
Encouraging a culture of experimentation Example quote: *"That sort of more freeform way of working. As a researcher, I'm very familiar with that way of working. I'm quite comfortable with that idea that, look, we've got some goals in mind. We've tried to, we set ourselves targets. If we don't get them all, that's fine. That's the nature of research. And then sort of you go backwards and forwards.*	Weekly design sessions to bring up and implement new ideas Example quotes: *"That just allows us to sit with all the stakeholders, anyone can come to that meeting, and we can present or talk through the ideas that we've got, and then, think back on it so that we can move that thinking along, quicker" — Project Manager* *"So what we're doing is putting up some, some easy wins, some sort of minimum viable product around personalisation, and then*	Encouraging a culture of experimentation and Designing in an agile way	Rapid Experimentation	Emergence, Adaptive tensions

Hopefully you ultimately go forward. But you also go backwards at times as well and that's not a problem." — Product owner 1	*seeing what people are using, and creating some persona worker profiles from that of who's using it, and who is doing more to then see how we can meet people's needs more effectively" — Product owner 2*			

D.6 Digital Platform Development Mechanisms

Open coding **Strategic level**	**Digital platform level**	**Axial coding**	**Aggregate Dimensions**	**Theoretical coding**
Changing strategic DT plans due to unforeseen obstacles. For example, the initial postgraduate model for moving offerings onto High-Ed M did not prove feasible for undergraduate offerings. Example quotes: *"Not everything is the right solution for groups of that size" — Analyst/ Programmer* Analyst/Programmer commenting on what an alternative solution could involve: [In these situations, the module would need to be] "*re-developed or*	Academic staff strategising by driving changes on the platform that were unforeseen at inception. Example quote: *"I think it's really interesting, cause it's not really a feature that was missing when you compared it to [legacy system]. It was like the move actually triggered the desire to do more than what the platform offered. So it was are we going to add this? It's not something we were able to do with [legacy platform] and we suddenly missed. It was a process triggered, you know greater needs"* — Member of the academic staff (user)	Changing strategic direction of platform development and User-driven platform design	Nonlinear leaping	Nonlinearity, Modularity

scaled up a bit more" — Analyst/ Programmer.				
Requirement to evolve platform Gamma to support a B2B model of operation, driven from the client organisation Example quote: *"Whole functionality of [Platform Gamma] is currently being revisited to give a better consumer experience for business owners" – Industry Collaboration Lead*	Developing modules for platform Beta using components that are easy to assemble through low-code modules. Example quote: *"You don't have to be a programmer to do it, an end user can do it" – Technical Lead*	Top-down, cross-organisational and Bottom-up platform development	Multilevel platform development	Multilevel effects

D.7 Improvisational Mechanisms

Open coding Strategic level	Digital platform level	Axial coding	Aggregate Dimensions	Theoretical coding
Monitoring the external environment to identify issues Example quote: *"As we think through this process, do we need to, do we need to spin up a [HighEd-M]-like thing in*	Monitoring the internal environment at the digital platform level to prevent security incidents Example quote: *"We got a few queries come through our support desk asking for it, and saying this is*	Monitoring the external and the environment	Multidirectional sensing	Multidirectional effects

[affected country]? Do we need to do something to actually open it up for students that were in [affected country] to Australia? How do we improve that bandwidth? Differences that are possible. What have other universities done? What are other organisations doing? Who are our vendors that we can tap into?" — Head of Platforms	*happening or what's going on. And so then, taking that to the [IT department] and then […] looking at [it] behaviourally and kind of from the university administration, like what kind of messaging is going out to students, reminding them of code of conduct and things like that. That kind of makes sense, but also looking at the technology itself, so working with [IT department] and what kind of settings there are, and security measures, they're looking at. — Support Services Manager*			
Rapid decision-making, involving different departments and levels in the organisational hierarchy. Example quote: *"One thing that happened fairly early with [ChatU] was that we got some [disruption] in classes. Luckily the academics involved reported it up the chain fairly quickly and we've actually got some changes to the [ChatU]license" — Head of School*	Tightening of security on the digital platform, as a result of rapid decision-making Example quote: *"So our central [AU-U] IT department added on some more security measures so that those [ChatU] meetings were more secure, or that we could be confident that the only people in those meetings were actually students or staff and that was important for the security of staff but also other students as well. That's an example of how the [IT] department had respond to the situation as it developed" — Head of School*	Fast cross-organisational decision-making	Cross-organisational fast feedback loops	Negative feedback, Multilevel effects
Using collaboration modules for teaching and learning Example quote:	Using chat modules for support services Example quote:	Novel strategic uses of digital platform and Novel uses of digital	Agile affordances	Emergence

"[CollabU] can be used for teaching, as a bit of a pseudo learning management system, and so it's been really interesting to watch that, grow and change" —Platforms Manager	*"[Now we're] relying on [chat modules] as a core part of our, kind of service. We had to change our rostering and upskill ourselves, I guess on how to handle [..] those chats coming in, cause normally we'd get like 2 a day and suddenly it was like 20 an hour, or something ridiculous. It's like when it's […] a low key part of what you're doing and then it becomes really essential. And I think the staff really appreciated having that chat" — Head of Operations*	platform for operations		
Fast changing of policies regarding the invigilation module Example quote: "[AU-U] was very careful, had a proper consent approach, all students had to consent, there was a new consent form, we didn't use the existing IT policies or anything like that" — Analyst/Programmer	Implementation of a new online invigilation module Example quote: *"And we did have to do […] work on online exams and online exam technologies, kind of had to be quite quickly condensed and brought forward so that we could meet the needs of this year" — Support Services Manager*	Introducing new policies and Extending digital platform to support operations	Agile redesign of critical operational processes	Emergence
Formation of emergency response committees. Example quote: "It became cleared and clearer we needed to formulate something real fast. The evolution of that was, there was a number of different committee that sprung up. And you	Reprioritisation of digital initiatives to address crucial changes to the digital platform Example quote: *"It basically caused us to reprioritise, rapidly. […] We had our goals generally aligned with what COVID-19 forced us to do. We had to deliver better online teaching, we wanted to have the right tools to support remote learning,*	Fast and Spontaneous formation of decision-making groups and Fast reorchestration	Adaptive Strategising	Self-organisation

know, no one's got time to be clear on the governance on those committees. It was all scrambled, but I think given that we were all in it, one of the pleasing things was everyone was incredibly cooperative about what they were doing, how that might impact and what we might need to change and adapt and be flexible" — Head of Platforms	*life-long learning, [organisational]strategy […] but COVID-19 forced our hand" — Analyst/Programmer*			
Training the staff Example quote: *"So, I think what happed in March, April, we got a flood of training requests and I think we basically set up this training for [ChatU] and [CollabU] and with [CollabU] we sort of did beginner or advanced. I think we trained about 400 people in about 5 weeks. So, there was that real strong demand" — Platforms Manager*	Acquiring more licenses Example quote: *"Definitely COVID […] not only in the use of technologies, but also in the work that's had to be done, to undertake, to […] make sure that it's scalable, so [ChatU] would be a good example. We have a number of licenses, it wasn't a very, […] highly used tool at the beginning of the year" — Support Services Manager* Fast adoption of modules Example quote: *"Then in March this year with COVID, again, [vendor] just contacted me one day and said, do you know, you're up to 25,000 active users, monthly active users?" — Platforms Manager*	Upskilling of staff, Scaling digital platform	Reactive digital fit	Nonlinearity

Emergency procurement measures Example quote: *"Some of those accrediting bodies required that the students sit an exam that's invigilated and proctored, which when we went completely online, we didn't have a solution for that. We had to procure through emergency procurement procedures, which is not an easy thing to do unless it's a huge compromise to the business, which it was" — Technical Manager*	Fast implementation of a new digital platform for online exams. Example quote: *"But COVID-19 forced our hand, so something like delivering exams online [online examinations] that would have normally been an 18 month project, we did it in 1, 2 sort of thing, just because it had to be done. There was no way about it" — Analyst/Programmer*	Accelerating existing processes and procedures and Extending the Digital platform	Increasing architectural resilience through variation	Modularity

D.8 Experimental Mechanisms

Open coding **Strategic level**	**Digital platform level**	**Axial coding**	**Aggregate Dimensions**	**Theoretical coding**
Opening new physical locations aboard Example quote: *"So it was about keeping existing students connected to the university, so they could continue their degree and I think it was also to try and help first year students*	Integrating existing modules for a more seamless workflow Example quote: "[HighEd-M] has got a [ChatU] plugin" — Head of Operations	Recombination of organisational and technical resources	Agile re-composition of organisational and technical components	Modularity

*start their degree. So these online learning centres – there's 3 locations in [country abroad]. The university set up, basically it was space within existing universities where there was reliable internet connection, where there were other [AU-U] students, so they could do a little bit of peer learning and there were tutors paid by [AU-U] to help students connect, make sure they got into the right subject, the right class, all those sorts of things and they also provided a little bit of liaison between [AU-U] academics and the students [abroad]" — Head of Schoo*l				
Mandating the use of the learning management platform for teaching and learning Example quote: *"From a teaching point of view it was ok to use it for say, increasing your engagement with your class and chatting and things, but there were certain things we didn't want academics to use [CollabU] for, so we didn't want them to put, their subject outlines in [CollabU]" — Platforms Manager*	Formal governance prevailing Example quote: *"So last week [academic] put in a request, how can we enable this feature in [CollabU]? So rather than we go and do that, we had a governance body meeting which has representatives from the teaching, the technology group and they were looking at their roadmap, and I said […] no we were actually going to roll out a different feature in [HighEd-M] or in our platform" —Platforms Manager* Decision to enable new features based on user preferences	Formal and User-led Governance	'Pendulum-like' governance	Oscillation dynamics

	Example quote: "[CollabU] starts coming out with breakout rooms and then they start going "*ohh,* you know academics want this and it's a good product and [CollabU] is better at these things and [ChatU] doesn't do that. So now they're pivoting and going well maybe we'll offer both" — Platforms Manager			