Roadmapping in Digital Transformation

Zada, Ashna Mahmood

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ROADMAPPING IN DIGITAL TRANSFORMATION

BY
ASHNA MAHMOOD ZADA

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ROADMAPPING IN DIGITAL TRANSFORMATION

By Ashna Mahmood Zada

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Aalborg University
Department of Computer Science
Selma Lagerløfs Vej 300
DK-9220 Aalborg

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Main Supervisor: Head of Department Peter Axel Nielsen
Aalborg University

Co-supervisor: Associate Professor John Stouby Persson
Aalborg University

Assessment: Associate Professor Markus Löchtefeld (chair)
Aalborg University, Denmark

Professor Matti Rossi
Alto University, Finland

Professor Leona Chandra Kruse
University of Agder, Norway

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Rolakam xwêndin bixwêne mekteba darmanî Kurd
Têgeştin merheme bo zamî bê samanî Kurd
Laperey mêju dezanê çon bun şêranî Kurd

– *Mamosta Qanih*

Bo Daykem u Babem, bo Mendalani Kurd

ENGLISH SUMMARY

In today's technology driven world, digital transformation has become a prerequisite for organizations striving to maintain relevance and competitiveness. Digital transformation, a process (re)defining organizations, is characterized by persistent challenges, particularly in multi-organizational contexts where diverse stakeholders must agree on a joint path forward. This dissertation explores roadmapping within the context of digital transformation, aiming to address how and to what extent roadmapping practices can serve as strategic tools and guidance for multi-organizational ventures embarking on digital transformation initiatives. Roadmapping is a method that involves exploration and the application of a temporal strategic perspective. Roadmapping enables interaction across disciplines, which can be crucial for guiding a path to a digital transformation involving multiple organizations. At the core of this dissertation is the central research question:

What roadmapping practices can support a multi-organizational venture to digitally transform environmental assessments?

This dissertation situates its investigation within environmental assessments, a legally mandated process for systematically evaluating the environmental impacts of potential developmental projects. These projects may encompass various sectors, including energy supply, transportation, and infrastructure development. Recognizing the importance of thorough engagement with the research setting, this dissertation adopts engaged scholarship as its research design. This approach enables the integration of theoretical concepts with practical considerations, facilitated through multi-leveled engagement with the researched context. This multi-leveled engagement facilitates an exploration of the research question from various angles. While qualitative, this engagement involved various research methods, including a case study to explore goal alignment complexities in multi-organizational ventures, grounded theory for new theory development related to roadmapping in digital transformation, a literature review to synthesize roadmapping and digital transformation fields, and a action design study for practical insights into roadmapping practices' real-world application.

In answering this research question, this dissertation provides a roadmapping framework, with three core activities – Backcasting, Exploring, and Re-orientating, tailored for practitioners and three roadmapping practices essential for navigating multi-organizational ventures engaged in digital transformation. These practices include (1) inductive experience gathering, which is instrumental to the deliberation of goals and processes in a digital transformation, (2) deliberative shifting, which helps reconcile competing perspectives in a digital transformation, and (3) articulating capabilities for realizing benefits, which helps reorient the temporal framing of a digital transformation.

These identified roadmapping practices accentuate the significance of a deliberative practice, emphasizing the importance of thorough exploration to understand objectives and the subtle yet essential recognition of diverse stakeholders.

DANSK RESUMÉ

I dagens teknologidrevne verden er digital transformation blevet en forudsætning for organisationer, der stræber efter at fastholde relevans og konkurrenceevne. Digital transformation, en proces som redefinere organisationer, er kendetegnet ved vedvarende udfordringer. Disse udfordringer er særligt relevante i en multi-organisatorisk kontekst, hvor diverse interessenter skal blive enige om en fælles vej fremad. I denne afhandling udforskes hvordan og i hvilket omfang roadmapping kan hjælpe den strategiske planlægning af en multi-organisatorisk digital transformation. Roadmapping er en metode, der involverer udforskning og anvendelse af et strategisk perspektiv med fokus på tid. Roadmapping muliggøre interaktion på tværs af fagligheder, hvilket kan være vigtigt for en digital transformation af flere organisationer, der sker samtidigt.

I denne afhandling stilles det centrale forskningsspørgsmål:

Hvilke roadmapping praksisser kan understøtte en multi-organisatorisk digital transformation af miljøvurdering?

Denne afhandling placerer sin undersøgelse inden for miljøvurdering, en lovpligtig proces til systematisk vurdering af miljøpåvirkningerne af potentielle udviklingsprojekter. Disse projekter kan omfatte forskellige sektorer, herunder energiforsyning, transport og infrastrukturudvikling.

Undersøgelsen er udført i samarbejde med organisationerne involveret i den digitale transformation af miljøvurdering i Danmark. Dette samarbejde muliggør integration af teoretiske begreber med praktiske hensyn og inkluderer skiftende engagement. Det skiftende engagement resulterede i en caseundersøgelse for at udforske kompleksitet af måludvikling i en multi-organisatorisk kontekst, grounded theory for udvikling af ny teori relateret til roadmapping i digital transformation, en litteratur gennemgang til at syntetisere felterne, roadmapping og digital transformation, og en aktionsdesignundersøgelse for at forstå anvendelsen af roadmapping i praksis.

I besvarelsen af det overordnede forskningsspørgsmål foreslåes et roadmapping-rammeværktøj med tre kerne aktiviteter – Backcasting, Udforskning og Re-orientering, målrettet praktikere. Derudover identificeres tre roadmapping praksisser, der er essentielle for at navigere multi-organisatoriske digitale transformationer. Disse praksisser inkluderer (1) induktiv indsamling af erfaringer, som er afgørende for udarbejdelsen af mål og processer, (2) deliberativ perspektivskift, der hjælper med at forlige konkurrerende perspektiver, og (3) artikulering af kapaciteter til gevinstrealisering.

Disse identificerede roadmapping praksisser understreger vigtigheden af grundig udforskning for at forstå målene og den væsentlige anerkendelse af diverse interessenter.

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In reflecting upon this journey, I must recognize the role Aalborg University has played in shaping my academic journey and my identity. I first set foot in Aalborg University in 2015, and as a first-generation university student, I remember feeling out of place. To claim that my path was without challenges would be a lie, yet there were more rewards than pitfalls. Each difficulty overcome and each breakthrough has paved the way for personal and intellectual growth, a path I am forever grateful to have tread upon. While only my name appears on the cover, I did not embark on this journey alone. This acknowledgment is for all the people who made this journey memorable, enjoyable, and survivable. Some of you were with me every step of the way; others joined later. However, I am thankful for you all.

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Ashna Mahmood Zada

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DISSERTATION OVERVIEW

Dissertation Title: Roadmapping in Digital Transformation
Ph.D. Student: Ashna Mahmood Zada
Ph.D. Supervisors: Prof. Peter Axel Nielsen, Aalborg University
Associate Prof. John Stouby Persson, Aalborg University

The main body of this dissertation consists of the following papers.

[P1] **Ashna Mahmood Zada**, Peter Axel Nielsen, and John Stouby Persson. 2022. *Setting Goals in a Digital Transformation of Environmental Assessment: A Case Study*. Published in International Working Conference on Transfer and Diffusion of IT (IFIP' 22). https://doi.org/10.1007/978-3-031-17968-6_12

[P2] **Ashna Mahmood Zada**, John Stouby Persson, and Peter Axel Nielsen. 2022. *Roadmapping in the Digital Transformation Literature*. Published in International Conference on Software Business (ICSOB' 22). https://doi.org/10.1007/978-3-031-20706-8_3

[P3] **Ashna Mahmood Zada**, Cathy Urquhart, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping for Digital Transformation: A Grounded Theory*. Submitted to Information Technology and People (Inf. Technol. People' 24).

[P4] **Ashna Mahmood Zada**, and Cathy Urquhart. 2024. *Open Coding Qualitative Data: An Essential First Step of Grounded Theory*. To appear in Grounded Theory in Action.

[P5] **Ashna Mahmood Zada**, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping a Digital Transformation: An Action Design Research Study of Environmental Assessments*. Submitted to European Journal of Information Systems (EJIS' 24).

This thesis has been submitted for assessment in partial fulfillment of the PhD degree. The thesis is based on the submitted or published scientific papers which are listed above. Parts of the papers are used directly or indirectly in the extended summary of the thesis. As part of the assessment, co-author statements have been made available to the assessment committee and are also available at the Faculty. The thesis is not in its present form acceptable for open publication but only in limited and closed circulation as copyright may not be ensured.

CONTENTS

1. INTRODUCTION

As a child of 1995, my formative years were shaped by the ritual of visiting the local 'Blockbuster' shop with my family, where I would casually stroll through aisles to choose a movie for that Friday. Fast forward to today's digital age, and the landscape has drastically changed. Children now navigate a realm of streaming services, like Netflix, where personalized movie recommendations are created using advanced data analytics. This evolution not only symbolizes a shift in entertainment preferences but also signifies a profound transformation in the way technology has redefined our everyday experiences.

The redefinition of everyday experiences extends beyond my individual memories, encompassing organizational transformations as well. Consider, for instance, the case of Nokia, which originally operated in the paper manufacturing industry, representing the very foundation of communication as the original medium. However, recognizing the evolving landscape, Nokia underwent a significant organizational shift, transitioning to become a major player in the telecommunications and mobile phone industry. This strategic move not only reflects the adaptability of organizations in response to changing technologies but also highlights the pivotal role of digital transformation in redefining entire industries (Bhatt, 2005).

On a societal level, social media platforms such as Facebook and Twitter have played a transformative role in shaping political discourse. During national elections, politicians and political parties leverage these platforms to connect directly with voters, share policy insights, and engage in real-time conversations. The use of hashtags, live videos, and interactive content has emerged as a prevalent strategy, enhancing citizen participation in political discussions. This shift in communication dynamics has not only redefined the way political information is disseminated but has also influenced the nature of public opinions and engagement in the democratic process (Price, 2013).

The pervasive impact of digital technologies is unmistakable, leading to a significant focus on digital transformation in both information systems (IS) research and among practitioners (Carroll et al., 2021; Wessel et al., 2021). One way to define digital transformation is as "*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*" (Vial, 2019). The notion of 'improvement' carries a positive connotation, representing the anticipated, though not assured, outcomes of digital transformation.

With a more critical view, the definition from Vial (2019) refers to a process, but, regrettably, adopts an 'entity' perspective rather than a 'process' perspective (Markus and Rowe, 2021; Van de Ven, 2007). Nevertheless, it is essential to consider the flexibility that the term entity provides, encapsulating various scopes of improvement, ranging from organizations and businesses to systems targeted by the digital transformation process. In this definition, 'triggers' serve as stimuli, prompting organizations to embark on the transformative journey. These triggers may be linked to organizational goals altering value-creation paths through innovation, technological advancements, or strategic imper-

atives. According to Vial (2019), digital transformation involves *significant changes*, disentangling it from more technology-centric terms like information technology (IT)-enabled organizational transformation and digitalization. This disentanglement highlights the profound transformations organizations undergo, emphasizing the importance and complexity of digital transformation.

1.1 The Persistent Challenges of Digital Transformation

While digital transformation holds transformative promises, it is crucial to acknowledge the persisting challenges that lie beneath the surface (Vial, 2019). The aim of this dissertation is to contribute practices for navigating the complexities of digital transformation. Subsequent sections will unfold the persistent challenges organizations face, emphasizing the imperative to pursue this comprehensive digital transformation agenda.

1.1.1 Navigating Multi-Organizational Collaborations in Digital Transformations

Building upon the broad scope of digital transformation introduced earlier, encompassing individual, organizational, and societal change, attention now turns to a specific challenge within the IS literature – the transformative scope. This challenge is particularly noticeable in the context of E-governance, where acknowledging the legitimate and diverse interests of multiple stakeholders is considered imperative.

However, articulating stakeholders' interests poses a significant challenge, often resulting in the ineffectiveness of E-governance projects in addressing them. This issue becomes critical as multi-organizational collaboration becomes increasingly prevalent (Askedal et al., 2019; Rose et al., 2018). Debates on digital transformation in business and management IS literature often center on individual business perspectives, emphasizing structural changes adopted to address digital transformations (Kraus et al., 2022). The dominant themes in business IS literature revolves around value creation, new business models, capabilities, and strategy (Kraus et al., 2022). While the literature recognizes the involvement of multiple organizations collaborating or undergoing changes at different levels (organizational, sectoral, and industry levels), it predominantly describes the complexities and challenges of multi-organizational settings (Askedal et al., 2019). Unfortunately, it offers limited guidance on effectively navigating these intricate collaborations (Askedal et al., 2019).

This emphasis on complexities and challenges highlights a significant gap in the literature, gravitating toward organizational, sectoral, or industry levels with insufficient attention given to the dynamics and interactions between private and public entities (Askedal et al., 2019). This oversight becomes particularly evident when considering the broader public interest, a pivotal aspect of multi-organizational digital transformations. Addressing this gap is crucial for a comprehensive understanding of digital transformations involving both private and public organizations, necessitating a nuanced exploration of the unique intricacies that emerge when private and public interests intersect in the context of digital transformations.

1.1.2 Incremental Change and Radical Transformation

Continuing from the previous subsection's exploration of transformative scope, this section examines the dynamics of 'digital' and 'transformation,' shifting the focus to the objectives of digital transformations – incremental changes versus radical transformations. In doing so, it builds upon the extensive exploration of these concepts in IS literature, where scholars emphasize the dynamic nature of 'digital transformation' and the varying interpretations and ambiguity present in literature and practice (Hausberg et al., 2019; Markus and Rowe, 2023). As mentioned earlier, IS literature disentangles digital transformation from IT-enabled organizational transformation, primarily focusing on incremental changes aligned with IT and organizational contexts (Wessel et al., 2021). Digital transformation is characterized as more radical, (re)defining organizations (Wessel et al., 2021). While the distinction is crucial for clarity, scholars typically prioritize reporting radical transformations, potentially overlooking the significance of incremental changes in a digital transformation process. However, some scholars suggests that achieving radical transformation through incremental changes could be a viable approach. These scholars emphasizes the importance of focusing on short-term decisions and actions with a long-term destination in mind (Li, 2020).

Whether practitioners lean towards incremental changes, radical transformations, or a combination of both, this divergence in perspectives emphasizes the dynamic and evolving nature of the digital transformation practice. A critical question that emerges is, how should organizations navigate the balance between incremental changes and radical transformations in their digital transformation journeys? This question prompts further exploration into the temporal aspects of these theoretical distinctions, necessitating scholars and practitioners to consider the nuanced interplay between short-term adaptations and long-term structural changes in the quest for effective digital transformations.

1.1.3 Thinking in Time

Introducing the concept of 'Thinking in Time' helps address challenges posed by short-term changes versus long-term strategic objectives. Exploring the temporal aspects of digital transformation includes a shift from conventional, linear notions of time to a more contemporary vocabulary. The contemporary vocabulary becomes imperative in the context of digital transformation, underlining the significance of temporality in navigating the complexities of transformative processes (Baygi et al., 2021).

Building on this exploration of temporality, another evident division in IS literature revolves around comprehending and 'narrating' time in an ephemeral world. The term 'ephemeral' conveys that phenomena such as digital transformation are "*not confined to a specific time frame or singular occurrence; the volatile nature of the ephemeral is also characterized by repetition and recombination*" (Doyle et al., 2022). This distinction shifts from conventional, linear ways of thinking about time to a more recent vocabulary consisting of 'timing,' 'attentionality,' and 'undergoing' (Baygi et al., 2021). This contemporary vocabulary suggests a need for challenging boundaries and, instead, focusing on timing, sensing new possibilities, and actualizing them (Baygi et al., 2021).

While this contemporary vocabulary of time provides answers, it also raises questions: how do we account for the various understandings of temporality in digital transformations? and how does it transform existing theorizing and research practices? This elaboration on temporality in digital transformations gives rise to another crucial aspect that demands attention – the knowing-doing gap.

1.1.4 The Knowing-Doing Gap

Building on the exploration of temporality in the previous section, the attention now shifts to the practical challenges embedded in the phenomenon known as the 'Knowing-Doing Gap' within digital transformation. This discussion emphasizes a division within IS literature – specifically, the struggle between abstract theoretical frameworks and tangible practical activities. The very nature of digital transformation sets it apart from past IT-related organizational changes; it is inherently emerging and resists complete explanation through established theoretical models (Markus and Rowe, 2023).

The challenge of theorizing digital transformation is evident, with some scholars arguing that it is not yet well theorized (Markus and Rowe, 2021). The difficulty lies not only in the quantity of theories but also in determining which theory best fits the dynamic nature of digital transformation. A predominant distinction emerges between 'grand theories' and those of narrower scope. Each presents its own set of challenges. Grand theories, despite their broad scope, may exhibit a potential weakness – they often fail to provide tangible insights for both research and practice (Markus and Rowe, 2021). Conversely, theories of narrower scope might face difficulty in capturing the complexity and breadth of digital transformations.

While previous research has provided practical insights through case studies and examinations of 'actual practices,' a persistent concern remains: many digital transformations may not fully realize their potentials (Tabrizi et al., 2019; Westerman and Davenport, 2018). This implies that organizations might be aware of the change but lack adequate guidance on how to prepare for it, revealing a knowing-doing gap (Kane, 2019; Reis et al., 2018; Vial, 2019; Wimelius et al., 2021). Given these challenges, there is a call for 'thinking differently about what we already know' concerning emerging phenomena, whether in theory or practical methods (Monteiro et al., 2022). The knowing-doing gap, uncovers the complexities organizations face in translating theoretical insights into practical, impactful actions during the digital transformation journey.

In addressing the complexities of the knowing-doing gap in digital transformation, the subsequent section shifts the focus to the core of this dissertation – the research question and the practice of *roadmapping*. This practice has been chosen to explain the challenges of finding direction in multi-organizational digital transformations. Roadmapping is defined in this dissertation as "*a method of inquiry and the application of a temporal strategic lens,*" (Kerr and Phaal, 2022) engaging interaction across disciplines. In the context of digital transformation, where challenges such as insufficient attention to private and public transformations, a tendency to overlook incremental changes, and

the need for understanding temporality exist, roadmapping emerges as an appropriate practice. The decision to adopt roadmapping lies in an interest in investigating how and to what extent roadmapping can be used to address the multifaceted challenges inherent in multi-organizational digital transformation. Despite being recognized as valuable for addressing disruptive changes, roadmapping tailored specifically for digital transformations is still in its early stages (Al-Ali and Phaal, 2019; Munch et al., 2020).

1.2 The Research Question

The persistent challenges outlined in existing IS literature, emphasize the complexity of digital transformations. As earlier outlined, this complexity is particularly evident within the context of multi-organizational collaborations. To comprehend the nuances of multi-organizational digital transformation, this dissertation is situated in an unusual case of environmental assessment. An environmental assessment is mandated by law for various situations like infrastructure development projects such as highways, airports, or bridges to evaluate their potential environmental impacts and promote sustainability (Garigliotti et al., 2023; Miljøministeriet, 2023a,b). The complexity of the environmental assessment process necessitates collaboration among diverse entities, both from the private and public sectors. The digital transformation of environmental assessments provides opportunities for advancing knowledge on how digital transformation unfolds across private and public organizations. Furthermore, environmental assessments go beyond digital transformation on an organizational level. They address a societal problem as the process ensures that projects adhere to environmental standards, emphasizing their role in contributing to a more sustainable future. Consequently, situating this dissertation in the digital transformation of environmental assessments allows for moving beyond a small-scale change and understanding a multi-organizational transformation.

The co-creative essence of roadmapping aligns with the complex nature of planning during multi-organizational digital transformations. Its dynamic process allows for real-time adjustments, making it a robust tool for navigating uncertainties and complexities. This dissertation aims to contribute to the maturation of roadmapping, acknowledging its potential in guiding organizations through transformative journeys. Originally employed in industrial practice, specifically for product development in Motorola, as documented by Willyard and McClees (1987), roadmapping has evolved and been customized for various organizational purposes such as strategic planning and innovation (Hajishirzi et al., 2022; Schallmo et al., 2017). Characterized by its co-creative and collaborative nature, roadmapping involves engaging stakeholders in workshops where negotiations about visions take place (Phaal, 2004). With its adaptability and engaging nature, roadmapping serves as a strategic and timely framework, guiding organizations through complex digital transformation processes.

In essence, this dissertation seeks to uncover how organizations can leverage roadmapping as a practice to guide their multi-organizational digital transformations, offering practical insights for both scholars and practitioners in the IS field. Through this exploration, this dissertation seeks to address the central research question:

What roadmapping practices can support a multi-organizational venture to digitally transform environmental assessments?

A 'venture,' within the context of this research question, refers to a collaborative and multi-organizational initiative aimed at digitally transforming environmental assessments. This initiative moves beyond the traditional understanding of IT projects, encompassing a more comprehensive collaboration and transformation of practices. Unlike standard IT projects, this venture involves a collective effort among diverse stakeholders, striving for a re-defining transformation of environmental assessment processes. The term venture implies that the initiative is not *just* a standard IT project but a strategic and collaborative effort that necessitates careful planning and guidance throughout the digital transformation process.

Correspondingly, the objective of this dissertation is to contribute to the broader IS literature by actively engaging in the multi-organizational venture of digitally transforming environmental assessments. Recognizing the need for deep engagement with the research setting, this dissertation employs engaged scholarship as the chosen research design. This approach facilitates the integration of theoretical considerations with practical concerns, involving different levels of researcher involvement and engagement with the researched context (Van de Ven, 2007). The chosen research design aligns with the interest in understanding how roadmapping, as a practice, can provide guidance within the complexities of the multi-organizational digital transformation of environmental assessments.

The dissertation continues with an in-depth description of digital transformation (Chapter 2), setting the stage for a practical framing of roadmapping (Chapter 3). These chapters contribute to the foundation for addressing the research question and the challenges associated with digital transformation. Subsequently, the research approach adopted in this dissertation is elaborated on (Chapter 4), followed by the main findings summarized across five papers (Chapter 5). A practical roadmapping framework tailored for practitioners accompanies the findings, providing actionable insights derived from the research (Chapter 6). Building on the insights from the five papers and the practical roadmapping framework, the discussion (Chapter 7) offers a comprehensive exploration of how this dissertation addresses the research question. The aim is to synthesize theoretical contributions and draw out practical implications, contributing significantly to the broader research in the IS field and for practitioners. Finally, the dissertation presents limitations and motivates future directions for fellow researchers, and concludes in (Chapter 8)

2. DIGITAL TRANSFORMATION

> We cannot become what we need by remaining what we are.
>
> From Max Depree (attributed)

Building upon the introduction's exploration of the persistent challenges in digital transformation, this chapter examines in more detail the implications of digital transformation for organizations and society. Digital transformation is often characterized as a dynamic process of change within an organization, driven by the disruptions brought about by digital technologies (Reis et al., 2018; Vial, 2019). In response, organizations are (re)defining their core values and creating new identities (Wessel et al., 2021) to ensure their survival. Beyond organizational boundaries, digital transformation extends its impact to social and technological transformations (Hanelt et al., 2021; Reis et al., 2018; Stolterman and Fors, 2004; Vial, 2019). In the following sections, this chapter explores the various understandings surrounding digital transformations. It proceeds to examine the motivations that drive digital transformation. Lastly, by reviewing existing IS literature, the chapter outlines current strategizing approaches and addresses the challenges organizations face in the process of digital transformation.

From a broader societal standpoint, digital transformation represents profound changes brought about by the widespread adoption of technologies (Vial, 2019). At the organizational level, digital transformation goes beyond technology (Kane, 2019; Wessel et al., 2021), requiring a comprehensive understanding of the transformation processes within the organization (Chanias et al., 2019). This emphasizes the complex and multifaceted nature of digital transformation. As earlier argued, one way to understand digital transformation is as "*a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies*" (Vial, 2019), or by drawing comparisons between digital transformation and IT-enabled organizational transformation (Wessel et al., 2021). Through this comparison, it becomes evident that the effect of digital transformation is the establishment of a new organizational identity, distinct from the typical outcomes of IT-enabled organizational transformation (Wessel et al., 2021). The new organizational identity arises from a more radical (re)definition of an organization's core values (Wessel et al., 2021).

Looking beyond the organizational scope, some broaden the understanding of digital transformation as "*the changes that the digital technology causes or influences in all aspects of human life*" (Stolterman and Fors, 2004). While abstract, this expanded view emphasizes how we live in a world,"*experienced with, through and by information technology*" (Stolterman and Fors, 2004), calling for an understanding of how the term 'digital' in digital transformation is connected to a broader and more comprehensive context or larger whole.

The understandings of digital transformations vary widely, as indicated by several sources in the IS literature (Bordeleau et al., 2021; Hausberg et al., 2019; Markus and Rowe, 2023). While IS literature has labeled digital transformation as something new by disentangling it from IT-enabled change (Wessel et al., 2021), there still is no common understanding of digital transformation. Building on these insights, digital transformation is understood as a) a process (re)defining organizations and b) changes that can occur at the level of an entity, organization, or all aspects of human life, driven by technology (Stolterman and Fors, 2004; Vial, 2019; Wessel et al., 2021).

2.1 The Motivations of Digital Transformation

Due to the far-reaching impacts of digital transformation, it has gained attention from both IS researchers and practitioners (Carroll et al., 2021; Vial, 2019; Wessel et al., 2021). While the number of papers on digital transformation has evolved over time, it was notably after 2014 that research in this area experienced substantial growth (Reis et al., 2018). Moving beyond IS research, multiple disciplines such as innovation, management, and strategic research have not only embraced but also redefined the term to suit their individual motives, contributing to the complexity of its conceptual boundaries (Hanelt et al., 2021; Markus and Rowe, 2023). This section aims to identify why IS researchers, small and medium enterprises, organizations, and practitioners are actively engaged in digital transformations.

The IS literature on digital transformation has explored the underlying motivations steering transformational change. As part of this exploration, IS literature suggests how enterprises use technology to improve their performance or competitive reach (Westerman et al., 2014). Consequently, for small and medium enterprises the adoption of new technologies is motivated by the prospects of gaining a competitive advantage. Others suggest that the use of technology is only one piece of the complex puzzle (Reis et al., 2018; Vial, 2019). Instead, the process of (re)defining should include strategy, changes to the structure, processes, and culture, and engagement of people (Kane, 2019; Vial, 2019). Such (re)definition extends beyond organizational boundaries, influencing individuals and social structures (Bordeleau et al., 2021; Kane, 2019; Tabrizi et al., 2019). Consequently, as organizational boundaries dissolve, the dynamics of collaboration and competition undergo significant transformation (Senyo et al., 2019), suggesting how digital transformation is not only motivated by individual organizations, or external factors, such as novel digital technology, but by a coalition of organizations, technologies, and external environmental factors (Hanelt et al., 2021). Take, for instance, the example of Nokia (presented previously as part of Chapter 1), then their (re)definition of their organization to become part of the telecommunications and mobile industry did not happen overnight. Instead, this change was motivated by external factors and the opportunities to use new technologies to improve their competitive reach. Consequently, this change included changing their business strategy and expanding collaborations (Bhatt, 2005).

2.1.1 Application Domains

The motivations driving digital transformation are wide-ranging, spanning diverse application domains, such as e-government, financial services, the health sector, and sustainability initiatives such as district heating (Ananjeva, 2023; Chanias et al., 2019; Krey, 2021; Rose et al., 2015). In the following section, the distinct motivations within each of these application domains are outlined.

In the context of e-governance literature, which focuses on public administration and its role in deploying IT, scholars have identified four ideals: professionalism, efficiency, delivery of public service, and public engagement (Rose et al., 2015). Within the ideal of professionalism, there is an imperative to support standardized administrative procedures. The efficiency ideal revolves around providing streamlined administration to minimize the waste of public resources, such as taxes. The services ideal underscores the delivery of services directed towards the public good. Lastly, the engagement ideal emphasizes facilitating deliberative interactions with the public and co-producing policies (Rose et al., 2015). Technological applications play a role in realizing these ideals. Information structures of databases and document management systems contribute to supporting standardized administrative procedures. Automation enhances the efficiency of administrative processes, minimizing the misuse of public resources. Information processing tools aid in the effective delivery of services for the public good. Additionally, technologies such as e-participation and e-democracy platforms foster deliberative interactions with the public, facilitating collaborative policy co-creation (Rose et al., 2015).

The impacts of digital transformation have also been emphasized in the well-established sector of financial services (Chanias et al., 2019; Karagiannaki et al., 2017). Here it is outlined how a combination of digital innovation, and societal and regulatory changes creates opportunities for non-traditional financial institutions to enter the market. However, these opportunities also pose challenges for established financial services. Correspondingly, established financial institutions are motivated to engage in digital transformation to modernize, become more flexible, and maintain competitiveness (Chanias et al., 2019; Karagiannaki et al., 2017).

Digital transformation is also gaining momentum within the health sector (Krey, 2021). A case study within the Swiss healthcare system emphasizes how digital transformation is viewed as an opportunity to increase the engagement of patients through technologies such as artificial intelligence, health apps, and big data (Krey, 2021). However, external factors, such as pressures to decrease costs and increase efficiency, prompt the health sector to engage in digital transformation (Kane, 2015; Krey, 2021).

Others suggest that digital transformation in sustainable energy practices, such as district heating, aligns with the overarching objective of environmental sustainability (Ananjeva, 2023). Within this domain, digital transformation, while motivated by a shared imperative for a sustainable future, is described as a complex process with competing concerns (Ananjeva, 2023). As illustrated, academic discussions about the motivations of digital transformations have been raised across various sectors such as e-government, financial services, the health sector, and district heating (Ananjeva, 2023;

Chanias et al., 2019; Krey, 2021; Rose et al., 2018). While technology is integral to the motivations driving digital transformation, as emphasized in this section, it extends beyond technology adoption. Digital transformation involves motivations such as extending competitive reach, increasing efficiency, enhancing public service delivery, and promoting a sustainable future. Despite the valuable insights contributed towards addressing digital transformation, it continues to impact and challenge individuals across different industries (Hanelt et al., 2021). Consequently, digital transformation remains an ongoing and intriguing problem to solve in academia and practice.

Moreover, digital transformation is inherently influenced by diverse motivations and the specific characteristics of each domain in which it is applied, acquiring distinct meanings and implications within domains, such as e-government, financial services, the health sector, and sustainability initiatives like district heating. This provided information is all valuable, however, beyond the scope of this dissertation, there is a noticeable lack of insights into digital transformation within the domain of environmental assessments. This lack of insights exists despite documented international digitalization projects within the environmental assessment domain (Bøss et al., 2021) and ongoing efforts to digitalize environmental assessments using technologies like artificial intelligence and knowledge graphs (Garigliotti et al., 2023; Sandfort et al., 2024). Specifically, the examination of ongoing and completed projects on digitalizing environmental assessments demonstrates the varying progress made by countries in transforming the environmental assessment process, ranging from stages of in-place, ongoing, and upcoming (Bøss et al., 2021). This progress suggests that, despite digital transformation efforts, the radical (re)definition within the domain of environmental assessments is still pending.

The broad application of digital transformation emphasizes the need for strategies to navigate the complexities within each domain. As digital transformation is positioned as a strategic response to the continuous emergence of new technologies (Li et al., 2018; Vial, 2019), it becomes essential to recognize that the approach to digital transformation strategy is not uniform. Strategizing differs significantly across various domains (Vial, 2019) and is dependent on the specific domain in which it operates. However, the existing IS literature on the actions practitioners should take is still considered at an early stage (Brown and Brown, 2019; Ribeiro, 2021). An exploration of the existing IS literature reveals diverse perspectives on activities guiding strategizing in digital transformation.

2.2 Strategizing in Digital Transformation

As earlier outlined digital transformation is understood as a) a process (re)defining organizations and b) changes that can occur at the level of an entity, organization, or all aspects of human life, driven by technology (Stolterman and Fors, 2004; Vial, 2019; Wessel et al., 2021). In contrast to viewing digital transformation as an emergent process, this dissertation characterizes it by intentional human agency and will, actively shaping the course of this change. This deliberate approach (Forester, 1999) emphasizes the central role of strategy in managing and directing the transformation. The term ‘strategy’ has been defined in various ways, yet consistently with a shared theme: it refers to a

deliberate and conscious set of guidelines that shape decisions for the future (Mintzberg, 1978) (p. 935). Correspondingly, this section unfolds the activities for strategizing in digital transformation as recommended by existing IS literature and addresses the outcomes resulting from strategizing.

2.2.1 Activities

The significance of a clear vision and well-defined goals in digital transformations is consistently emphasized in IS literature as an essential first activity (Bucy et al., 2016; Chanias et al., 2019; Krey, 2021; Peppard, 2020). Transformation goals, as specified across IS literature, are approached from three perspectives: organization-centric, societal, and technological (Ebert and Duarte, 2018; Reis et al., 2018; Vial, 2019). Other perspectives for approaching goals have also been proposed. These range from considerations of internal efficiency and external opportunities, to disruptive change (Parviainen et al., 2017). Additionally, strategic roles for information technologies have been outlined, encompassing automation to improve efficiency, information up and down for enhanced decision-making and collaboration, and transformation to alter existing capabilities and acquire new ones (Vial, 2019). However, a notable gap exists in practical guidance, particularly concerning collaborative goal development among diverse stakeholders (Matt et al., 2015; Rose et al., 2018). Consequently, challenges in reaching digitalization goals are not uncommon, especially in initiatives involving multiple stakeholders (Peppard, 2020; Tabrizi et al., 2019; Westerman and Davenport, 2018).

For goal-setting scholars have suggested a bottom-up approach, focusing on what goals can be achieved locally with new digital tools and building strategic initiatives from this foundation (Leonardi, 2020). Noteworthy contributions have also been made within specific application domains, such as healthcare systems. For instance, a six-phased model featuring 30 activities is presented, with the initial two phases encompassing goal-setting. This process involves examining and documenting the current state, which is then translated into objectives for digital transformation. These objectives should encompass aspects related to time, finance, space, and quality (Krey, 2021). Similarly, goal-setting has been proposed as an analytical process of evaluating and assessing various scenarios in terms of their feasibility for the organization, and based on that analysis define clear goals for the digitalization (Parviainen et al., 2017).

Other activity models revolve around the processes of digital business strategy towards digital transformation. Digital business strategy emerges as a synergy between business and IT strategies, guiding the multifaceted changes triggered by digital technologies (Brown and Brown, 2019; Matt et al., 2016). Proposed as the link between digital business strategy and the actual process of digital transformation (Brown and Brown, 2019), digital transformation strategies, from a business-centric perspective, consider the transformation of products, processes, and organizational aspects stemming from new technologies (Chanias et al., 2019; Matt et al., 2015). Specifically, the creation of a digital transformation strategy involves iterating between learning and doing (Chanias et al., 2019) and is subject to continuous reassessment (Matt et al., 2016). Building upon existing theories from IS strategizing research and practices, Chanias et al. (2019) developed a sequential activity model for

creating a digital transformation strategy based on a case study in the financial service sector. This digital strategizing process is articulated through six phases (Chanias et al., 2019):

1. Setting the stage.
2. Initially formulating the digital transformation strategy (comprising top-down and bottom-up building blocks).
3. Preparing for implementation.
4. Starting the implementation.
5. Finding a working mode.
6. Enhancing the strategy.

However, this strategizing process begins with phase zero, emphasizing the recognition of the need for a comprehensive digital transformation. Notably, the following phase, 'Setting the stage,' entails the establishment of a digital transformation unit operating independently of the IT department. This unit should include representatives from all organizational departments, underlining the importance of inclusivity in digital transformation strategy development. Together, these activities collectively constitute the process of strategizing aimed at addressing digital transformation challenges (Chanias et al., 2019).

Similarly, other scholars advocate for considering dimensions of digital transformation as a way to formulate digital transformation strategies (Hajishirzi et al., 2022; Matt et al., 2015). To coordinate the various independent aspects of digital transformation into a strategy, organizations are advised to consider four essential dimensions: (1) the use of technologies, (2) changes in value creation, (3) structural changes, and (4) financial considerations (Matt et al., 2015). These dimensions serve as an initial step to assist organizations in shaping a robust digital transformation strategy (Matt et al., 2015). The use of technologies includes an understanding of the company's attitude towards new technologies and abilities to exploit these technologies (Matt et al., 2015). Considerations about changes in value creation include assessing the extent to which new digital activities diverge from existing business practices. Structural changes involve how a company organizes itself, especially when integrating new digital activities. It is important to identify whether these changes affect products, processes, or skills. However, the transformation of the first three dimensions is dependent upon addressing financial aspects. These include a company's financial capability to fund a digital transformation initiative, which can serve as both a driving force and a limiting factor for the transformation (Matt et al., 2016). Drawing from a cluster analysis of existing literature further dimensions to consider are: the allocation of responsibilities among individuals and the ability to respond to external pressures ensuring ongoing relevance (Hajishirzi et al., 2022). The allocation of responsibilities among individuals encompasses factors such as competency, skill, and attitude (Matt et al., 2015). External pressures can arise from regulations, policies, new technologies, and sustainable development (Hajishirzi et al., 2022).

Despite proposed activities, phases, and dimensions, the literature suggests that organizations are primarily managed based on traditional thinking, facing challenges related to strategy and technology exploitation that could negatively impact the perceived value of digital transformation (Bordeleau et al., 2021). Challenging traditional sequential processes for digital transformation, the literature proposes three approaches to leading digital transformation (Li, 2020; Zaoui and Souissi, 2020). These approaches encompass: (1) innovating through experimentation, (2) achieving radical transformation through incremental changes, and (3) developing dynamic sustainable advantages through an evolving portfolio of temporary advantages (Li, 2020). Within these approaches, strategy is not considered a predefined plan and direction for actions. Instead, strategy encourages a focus on short-term decisions and actions, with a long-term destination in mind (Li, 2020). The first approach, innovating through experimentation, addresses the uncertainties of digital transformations, where paths and destinations are shifting. Within this first approach, it is recommended to try out many new ideas inexpensively, using internal or external resources. If the evaluation of an idea is positive, then it calls for rapidly scaling it up; if not, move on to other ideas. The second approach, radical transformation through incremental changes, involves breaking up large-scale transformation into smaller, manageable strategic investments. This approach allows for testing a portfolio of ideas and continuously moving forward, avoiding the risk of 'placing all on one idea.' The third approach involves creating dynamic sustainable advantages by maintaining an evolving portfolio of temporary advantages. In this approach, the goal is to introduce new temporary advantages before the existing ones lose their effectiveness. While each temporary advantage may be modest on its own, their impact over time can be substantial (Li, 2020).

As outlined, literature recommendations for proceeding with digital transformation often prescribe a specific destination (Bucy et al., 2016; Chanias et al., 2019; Krey, 2021; Peppard, 2020), emphasizing the importance of strategy formulation, whether through activities, phases, dimensions, or approaches.

2.2.2 Outcomes

Having outlined the activities of strategizing in digital transformation, the next logical question is to explore the outcomes of these strategic initiatives. While strategizing involves the deliberate efforts, activities, and decisions made by the organization, guided by both top-down and bottom-up approaches, then the *realized* digital transformation strategy represents the outcome of these efforts at a specific point of time (Chanias et al., 2019). The realization of a digital transformation strategy indicates that the organization has moved beyond the planning or formulation stage to actively implementing and executing the strategy. It reflects the practical application of the strategic decisions made during the strategizing process. The continuous evolution of the realized digital transformation strategy also emphasizes that strategizing is an ongoing, dynamic activity that adapts to changes in an organization's environment and goals (Chanias et al., 2019).

Another tangible outcome of strategizing in digital transformation is the enhanced business model canvas (Caputo et al., 2021; Schallmo et al., 2017). A business model is a visualized framework

of an organization, outlining the benefits it delivers to customers and partners. It addresses how these benefits translate into revenue for the company. By creating value, a business model allows for differentiation from competitors, the establishment of strong customer relationships, and the attainment of a competitive advantage (Schallmo et al., 2017). In essence, business models serve as tools that translate developed strategies into visual frameworks, providing a practical guide for navigating the market and achieving organizational objectives (Schallmo et al., 2017).

An additional important outcome of the strategy-making process in digital transformation is the development of digital leaders equipped with the necessary capabilities for effective leadership in the digital context (Kane, 2019). A digital leader is not necessarily one with the most digital literacy, although a certain degree is necessary. Digital literacy is simply knowledge about business value and technologies, like blockchain, augmented or virtual reality. Instead, characteristics include someone with a transformative vision, an ability to be forward-looking, and change-oriented (Kane, 2019). In this understanding, the outcomes of digital strategizing should not result in implementing technologies but rather an overall culture change within the organization. Such culture change includes role changes starting with the leaders and changing the organization to be more agile, risk-tolerant, open for collaboration, and experimental (Kane, 2019).

As outlined earlier, despite these strategizing recommendations and their outcomes, existing IS literature also reports how many digital transformations do not necessarily reach their intended goals (Li, 2020; Peppard, 2020; Tabrizi et al., 2019; Westerman and Davenport, 2018), indicating a knowing-doing gap (Reis et al., 2018; Vial, 2019; Wimelius et al., 2021). The knowing-doing gap emphasizes the persistent challenges in addressing digital transformations (Avital et al., 2019; Brown and Brown, 2019; Chanias et al., 2019; Markus and Rowe, 2021).

2.3 Challenges in Digital Transformation

As shown, digital transformation changes the operational and competitive environments within which organizations function, making them rethink their strategies. Recent IS research has explained how organizations undergoing digital transformation face multiple challenges, which often act as a barrier to their transformations (Soh et al., 2019; Wimelius et al., 2021). Correspondingly, within the IS literature, a range of challenges is acknowledged. However, this section addresses challenges associated with:

- Resistance to change
- Limited resources
- Competing perspectives

Within the context of internal challenges to digital transformation, resistance to change stands out as a significant challenge (Vial, 2019). This resistance is typically observed as employees' opposition to

the adoption of new technologies or strategies within the organization (Matt et al., 2015; Vial, 2019). Various factors contribute to this resistance, including innovation fatigue, the pace and methods of introducing new technologies, and the inertia ingrained in daily work routines. Overcoming resistance requires not only changes in employee behavior but also modifications to processes to enhance adaptability to change (Vial, 2019). Inertia presents another significant challenge, arising when existing resources, capabilities, and time constraints act as barriers to transformation (Vial, 2019; Vogelsang et al., 2019). Consequently, inertia and resistance often stem from a lack of visibility regarding the potential benefits of digital technologies (Hajishirzi et al., 2022; Pora et al., 2020; Vial, 2019; Westerman and Davenport, 2018). Additionally, limited resources can hinder an organization's ability to realize the expected benefits of digital initiatives. This ability is further challenged as formulating expected benefits, establishing ownership, understanding necessary business changes, and enabling changes continue to present challenges (Askedal et al., 2019). Existing literature proposes how navigating these challenges, requires careful consideration of resource allocation between new digital initiatives and other organizational domains (Soh et al., 2019). Additionally, within existing literature there is an emphasis on the need for strategic approaches, such as extending benefits management models and using benefits dependency models (Askedal et al., 2019; Peppard, 2020), to manage the interrelated challenges of inertia, resistance, and limited resources.

An integral element of discussing benefits is the notion of time (Askedal et al., 2019). As previously outlined in (Chapter 1) significant attention has already been directed towards the temporal framing of digital transformation. Challenges associated with the restrictions of time could be about the duration of the transformation process, the timing of specific milestones, or the synchronization of changes across different organizational functions (Soh et al., 2019). While existing IS literature has suggested a shift from a linear time perspective to a vocabulary including 'timing,' 'attentionality,' and 'undergoing' (Baygi et al., 2021), a need for a more dynamic and adaptable approach in navigating the temporal complexities of digital transformations still persists (O'Connor et al., 2023).

The first two challenges, resistance to change and limited resources, encompass diverse views on different aspects. This diversity aligns with the notion of competing perspectives. In this dissertation, competing perspectives refer to situations where different viewpoints or approaches are in competition with each other. While the IS literature has identified several competing perspectives within the context of digital transformation, this dissertation understands that the challenges likely present in digital transformation involve competing perspectives related to diverse views (plurality) (Ananjeva, 2023; Soh et al., 2019). In a longitudinal case study of district heating, diverse views on digital transformation were identified by Ananjeva (2023) as four process views, optimization, eco-feedback, reflection, and participation. Within this context, these competing views emphasize how transforming towards sustainability includes challenges related to diverse views on the problem, solution, and assumptions of sustainability.

Moreover, the challenge of balancing goals arises when operating in an environment with multiple stakeholders. This challenge becomes particularly pronounced when some stakeholders have a clear vision of pursuing their own distinctive paths (Chanias et al., 2019). The complexities associated with assessing actions and goals in intricate, pluralistic business contexts have been underscored

by Vial (2019). These competing perspectives among stakeholders, coupled with the challenges of identifying the 'right' goals, may explain why organizations fall short of achieving their digitalization goals (Peppard, 2020; Tabrizi et al., 2019; Westerman and Davenport, 2018).

In legitimizing the existence of different perspectives on an 'issue' is the concept of reconciliation (Ananjeva, 2023). Emphasizing how reconciliation is an ongoing process, (Ananjeva, 2023) asserts that it involves legitimizing the existence of different perspectives on an issue and that the 'solution' to a situated problem is something created when practitioners collaboratively work together.

To summarize, in situations characterized by resistance to change, limited resources, or competing perspectives, digital transformations become more challenging. If these challenges are ignored or not effectively addressed, it can lead to defensive responses within the organization. Defensive responses are considered to be short-term workarounds used to avoid conflict (Soh et al., 2019). These defensive responses may temporarily lessen the challenges but ultimately hinder progress and fail to resolve the underlying issues (Soh et al., 2019). For instance, implementing defensive responses may lead to increased competitiveness among different groups with diverse views within the organization, as they might feel their views and identities are being neglected or undermined (Jarzabkowski et al., 2013; Soh et al., 2019). Despite some shared recommendations, such as increased collaboration, employing cross-functional teams, and promoting a culture of learning (Chanias et al., 2019; Kane et al., 2017; Matt et al., 2015), it remains unclear which actions are appropriate for which challenges (Soh et al., 2019).

3. ROADMAPPING

As outlined in the previous discussions, digital transformation offers diverse transformative promises, yet it also presents persistent challenges for both IS researchers and practitioners. These challenges emphasize the importance of prioritizing the transformative journey over the outcome. In this regard, roadmapping and roadmaps emerge as essential tools, offering support to organizations in planning and alignment, as they navigate their transformative journeys (Kerr and Phaal, 2022). Roadmapping, originating from industrial practice, notably in product thinking, has evolved through contributions from researchers based in Cambridge, as exemplified by Kerr et al. (2019); Phaal (2004); Willyard and McClees (1987). As a strategic planning tool, roadmapping has been refined through real-world industry experiences, gaining widespread application in various fields, including IS (Hajishirzi et al., 2022; Parviainen et al., 2017). As previously argued, the choice of roadmapping as a practical lens is rooted in the interest to explore its potential for addressing the multifaceted challenges inherent in digital transformation. The subsequent sections describe the nuances of roadmapping and the practical approaches to roadmapping, often executed through workshops, demonstrating the dynamic and interactive nature of roadmapping. Then, the definition of roadmaps will be examined, offering a comprehensive understanding of the outcome of roadmapping.

3.1 Defining Roadmapping

Like digital transformation, the terms 'roadmapping' and 'roadmaps' lack a universally accepted definition and can, therefore, be interpreted from different perspectives (Kerr and Phaal, 2022). In literature, roadmapping is often simplified as 'the process of creating a roadmap,' maintaining a clear distinction between the process 'the actual act of mapping' and its resulting outcome 'the roadmap' (Kerr and Phaal, 2022; Phaal and Palmer, 2010). Scholars emphasize the significant value of engaging in the entire roadmapping process, asserting that its importance extends beyond the creation of a final roadmap (Kerr and Phaal, 2022; Willyard and McClees, 1987). To move beyond the conventional portrayal of roadmapping as the mere process of creating roadmaps, the definition embraced in this dissertation is "*a method of inquiry and the application of a temporal-spatial structured strategic lens*" (Kerr and Phaal, 2022), which engages interaction across disciplines.

Both roadmapping and roadmaps share a common characteristic – they are visual (Kerr and Phaal, 2022). During the roadmapping process, a visual workshop chart is commonly incorporated, as an elicitation and exploration tool, actively used for collaboration. Depending on the workshop's context, this chart can take various forms, like a whiteboard, digital collaboration software, or physical sticky notes. This workshop chart facilitates the capture and storage of information during discussions, encouraging participants to contribute their knowledge (Kerr and Phaal, 2022). This interactive approach emphasizes the workshop chart's role in supporting participatory planning and communication across stakeholders (Kerr and Phaal, 2015). The output of these workshops needs to

be summarized into a visual representation suitable for onward communication between stakeholders and across organizations (Kerr and Phaal, 2015, 2022). Typically, this visual representation includes the core elements of the strategic plan presented in a multi-leveled format (Kerr and Phaal, 2015; Kerr et al., 2019). Therefore, another distinction between roadmapping and roadmaps lies in their respective purposes: knowledge elicitation and knowledge communication (Kerr and Phaal, 2015; Phaal and Muller, 2007, 2009). More recent suggestions propose viewing roadmapping as "*a practical form of information processing and the roadmap as a form of communication*" (Kerr and Phaal, 2022).

As roadmapping has transformed from its origins in product thinking into various frameworks that address strategy, business, data, and design processes (Al-Ali and Phaal, 2019; De Oliveira et al., 2022; Han and Geum, 2020; Schaller et al., 2018), each serving distinct purposes for practitioners. Given the dynamic nature of the environment, characterized by continuous technological advancements, organizations may find it imperative to align their product development strategies with emerging technological opportunities to ensure their adaptability and survival. This alignment extends beyond product development to influence strategic plans, business models, innovation, data utilization for competitive advantage, and responsiveness to evolving customer perspectives. In recognizing roadmapping as a dynamic and interactive practice, one key aspect of this practice is the incorporation of workshops during the roadmapping process.

3.1.1 The Common Practice of Workshops

The use of workshops is a common practice among various roadmapping frameworks, like product-technology, strategy, business, data, and design. These workshops are usually facilitated by individuals or teams with expertise in roadmapping and involve participants from different departments or organizations (Kerr and Phaal, 2015). Across the roadmapping frameworks, the central aim of the workshop format remains consistent: strategic planning (Phaal and Muller, 2009). Strategic planning typically includes negotiating visions, identifying opportunities, and charting the path to change (Al-Ali and Phaal, 2019; Kerr et al., 2019; Munch et al., 2020; Phaal, 2004; Phaal and Muller, 2009). Importantly, this process should involve different participants representing different perspectives, functions, disciplines, and external perspectives where necessary (Phaal, 2004; Phaal and Muller, 2009). During workshops, the quality of knowledge elicitation depends on participants' interactions, encompassing diverse perspectives and idea-sharing about the future. These interactions correspond to addressing questions about what, why, when, where, how, and who encourages a know-how aspect (Kerr and Phaal, 2022; Phaal, 2004). The collaborative and inclusive principles of roadmapping make it a valuable tool for articulating and planning broad-scope change. Notably, the workshop-based negotiation inherent in roadmapping encourages participatory planning, addressing challenges related to time and direction.

The two most frequently mentioned approaches are product-technology and strategic roadmapping (De Oliveira et al., 2022; Kerr and Phaal, 2019). The product-technology roadmapping approach is considered a fast-start approach, which aims to support product planning. The purpose of product-technology roadmapping is to initiate the roadmapping process as rapidly as possible to develop a

first-cut roadmap (Phaal et al., 2004). Product-technology roadmapping consists of three stages: 1) planning, which involves customizing a generic approach, 2) workshops, and 3) roll-out stage.

The roll-out stage bears similarities to pilot testing conducted in qualitative interviews. This stage is employed to address and incorporate insights gained during the initial fast start roadmapping, guiding improvements in how the ongoing roadmapping process should be carried forward (Phaal et al., 2004). It has been customized to fit various purposes, and it is argued that it may be adapted for multi-organizational use by capturing the environment and opportunities for a specific group of stakeholders in a technology area (Phaal, 2004). In essence, the purpose of product-technology roadmapping is to deliver a plan for advancing products and technologies based on market needs or technological opportunities (De Oliveira et al., 2022).

Similar to product-technology roadmapping, the process for strategic roadmapping is also considered a fast-start strategic process. In contrast to product-technology roadmapping, the purpose of strategic roadmapping is to capture a narrative, encompassing choices, and directions that guide the organization towards their strategic aims (De Oliveira et al., 2022; Phaal et al., 2007). The strategic roadmapping process encompasses three key steps: 1) planning, which also involves customizing a generic approach, 2) workshops, which involve transitioning from the strategic landscape to exploring opportunities and agreeing on a way forward, and 3) review, ensuring actions are progressing (Phaal et al., 2007). Fundamentally, the purpose of strategic roadmapping is to outline opportunities and a path forward, making it relevant for planning and innovation.

Differing in its purpose is the roadmapping approach, backcasting. Backcasting is specifically centered around the activity of determining the future vision first and then working backward to identify the steps needed to reach that future (Okada et al., 2020). For bridging the gap between the present and the future, backcasting includes four steps: 1) preparation, 2) workshops, 3) developing pathways, and 4) post-workshop activities (Okada et al., 2020). During the workshops, a central aspect involves describing a logic tree based on ideas and developing a storyline that centers around a cluster of ideas, describing the vision (Okada et al., 2020).

Although product-technology roadmapping, strategic roadmapping, and backcasting differ in their purposes and approaches towards people and the process, they all incorporate the use of workshops, as exemplified (in Figure 3.1 and Figure 3.2). This commonality suggests that, methodologically, workshops play a significant role in roadmapping across all variants. For these variants, the dynamics inherent in the roadmapping process stems from the imperative to keep the information captured in the roadmap up-to-date as events unfold. This particular imperative suggests the continuous need for updating the roadmap, thereby keeping it alive (Phaal, 2004).

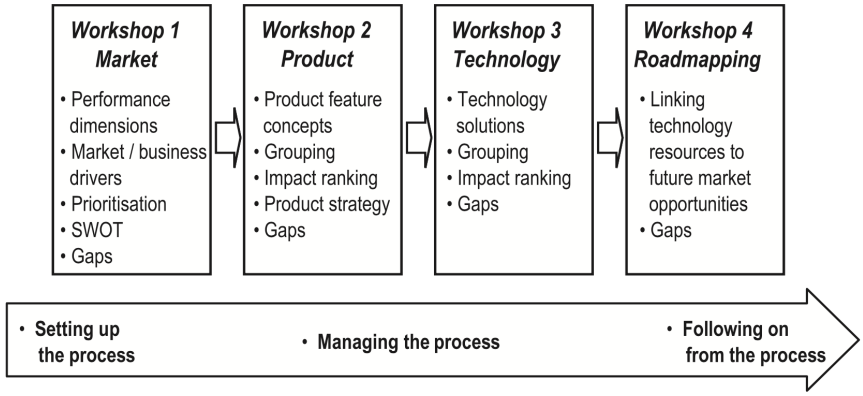

Fig. 3.1: Workshop Process for Product-Technology Roadmapping. From (Phaal, 2004) p. 17

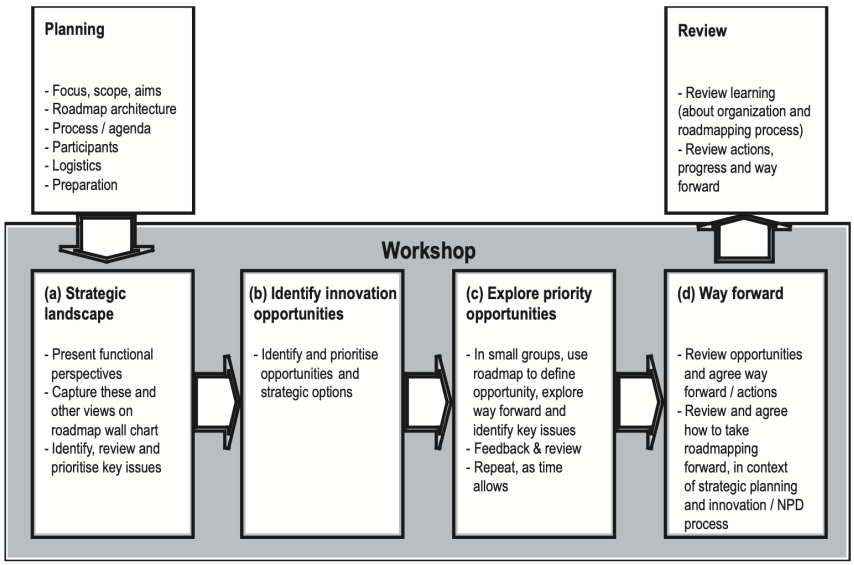

Fig. 3.2: Workshop Process for Strategic Roadmapping. From (Phaal et al., 2007) p. 7

3.2 Defining Roadmaps

Building upon the observation of continuous updates in the roadmap, the following section focuses on a foundational exploration of the definition and key elements that constitute roadmaps.

A roadmap is an attractive metaphor; however, admittedly, it has, on several occasions, been misunderstood literally as a physical map for navigating roads. It is, therefore, imperative to define what it is. One way to conceptualize a roadmap is as "*an extended look at the future of a chosen field of inquiry composed from the collective knowledge and imagination of the brightest drivers of change in that field*" (Kerr and Phaal, 2022). This definition carries positive connotations, portraying roadmaps as timely frameworks that offer ways of imagining new opportunities in any chosen field. It emphasizes the flexibility of roadmaps as adaptable tools suitable for various contexts, given their customization for specific contexts. This flexibility also brings forth the recognition that there is no one-size-fits-all roadmap optimal for every organization (Phaal et al., 2004). Additionally, the notion of 'collective knowledge' encourages joined-up thinking about the future (Kerr and Phaal, 2022; Phaal and Palmer, 2010). More fundamentally, there is room to question the meaning of an 'extended look' and how it aligns with existing literature and practical applications.

Visualizing roadmaps can take a variety of forms, everything from simplified tables, flowcharts, and pictorials to divisions in phases related to where, why, what, when, and who (Phaal, 2004). Most commonly a roadmap is structured through multiple layers, which communicate different perspectives, typically, technologies, markets, and products as known from product-technology roadmapping or extended with business, skills, and organizations as in strategic roadmapping (Phaal, 2004; Phaal and Muller, 2009). Since roadmapping is condensed to a simple high-level visual representation indicates how the structure of the roadmap visualization is essential (Kerr and Phaal, 2017). Despite literature providing guidelines on how to structure roadmaps effectively, the practical application reveals chaotic roadmaps (as exemplified in Figure 3.3).

While there is theoretical knowledge on structuring roadmaps in micro, macro, and meso perspectives (de Souza et al., 2020; Kerr and Phaal, 2019; Simoes Freitas et al., 2022), the contrast between theoretical knowledge and practical application exemplifies the ongoing difficulties encountered when transforming complex roadmapping processes into clear and coherent visual representations.

Notably, across all visualizations, time stands out as a prime parameter, often divided into present, short-, medium-, and long-term, resulting in the end state or vision. Explicitly addressing time in roadmaps, as suggested across literature (Kerr and Phaal, 2022; Phaal, 2004; Phaal and Muller, 2009) makes them dynamic. It also facilitates collaboration and negotiation among stakeholders, making roadmaps practical tools for collectively planning and adapting to the future. Despite being characterized as temporal narratives (Kerr and Phaal, 2022), literature also emphasizes the use of 'spaces' or intentional gaps within roadmaps to enhance flexibility and adaptability (Munch et al., 2020; Phaal, 2004). These spaces are incorporated to accommodate uncertainties and recognize the ephemeral nature of the environment in which roadmaps unfold. Rather than viewing roadmaps as fixed, this approach acknowledges that the future is not always predictable and linear.

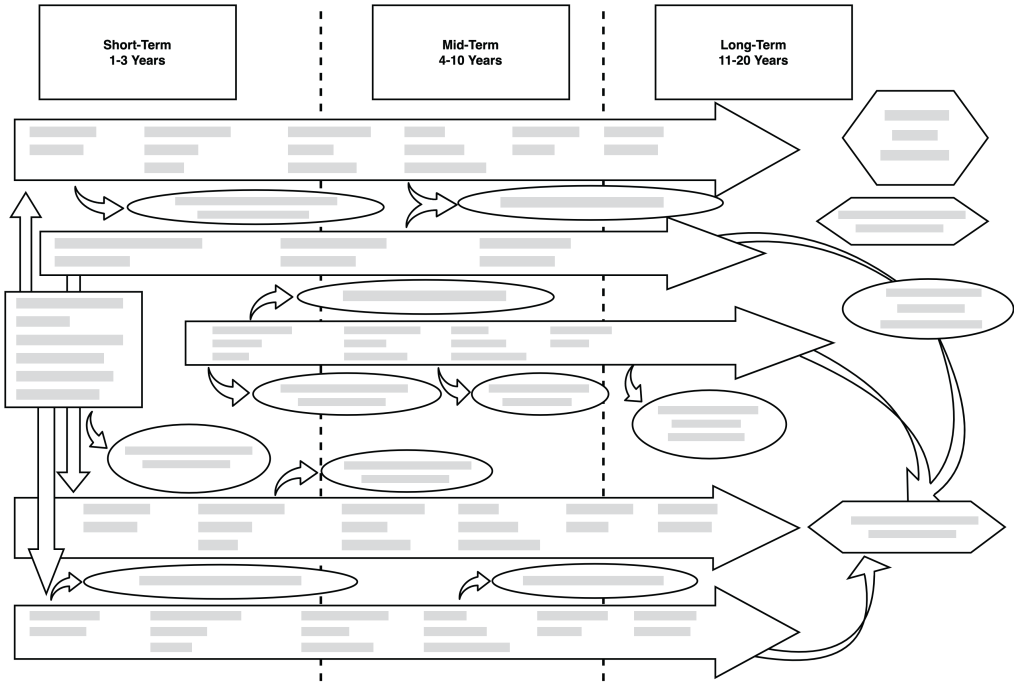

Fig. 3.3: A Chaotic Roadmap. Adapted from (Kerr and Phaal, 2017) p. 35

4. RESEARCH DESIGN

> Connecting theory and practice is no simple trick, but when it occurs it can trigger dazzling insights.
>
> From Van de Ven (2007) p. 260.

Despite the valuable contributions of IS literature to understanding digital transformation, persistent challenges remain inherent in the process, prompting the exploration of alternative approaches. While roadmapping has been proposed as one such alternative (Al-Ali and Phaal, 2019; Chanias et al., 2019; Parviainen et al., 2017), it is essential to emphasize the need for theoretical and practical exploration to situate roadmapping in the context of digital transformation. Therefore, this dissertation situates and apllies roadmapping within the context of multi-organizational digital transformation in environmental assessments. A key objective is understanding 'how' roadmapping emerges and develops within this context, which is crucial for achieving the overall objective.

To navigate these challenges and to gain a comprehensive understanding of roadmapping in digital transformation, the dissertation aligns with Van de Ven's engaged scholarship approach (Van de Ven, 2007). Engaged scholarship integrates theoretical considerations with practical concerns and involves transitions across four forms: Detached, Attached, Understanding, and Control (Nielsen and Persson, 2016; Van de Ven, 2007). These forms represent different levels of researcher involvement and interaction with the researched context. Figure (4.1) visually illustrates the transitions within engaged scholarship, emphasizing its role in guiding the research process of this dissertation. The engagements are further explained (see Sections 4.2, 4.3, 4.4, and 4.5) and involve an attached collaborative approach through a case study, a literature review refraining from direct engagement, a detached form of engagement as a grounded theory study, including a reflective understanding of the application of grounded theory, and, lastly, a return to an attached approach through action design research. The results of these forms of engagements are reported in five papers, further summarized in (Chapter 5). Throughout these transitions, the guiding principle is that "*the research question about the problem domain drives the engaged scholarship process*" (Van de Ven, 2007) (p. 268). The research question posed in this dissertation is:

What roadmapping practices can support a multi-organizational venture to digitally transform environmental assessments?

A critical aspect of this dissertation involves the deliberate choice of the research setting, focusing on the challenges and dynamics of digital transformation in environmental assessments across multiple organizations. The engagement in this research setting enhances the applicability and relevance of this dissertation's findings to real-world applications.

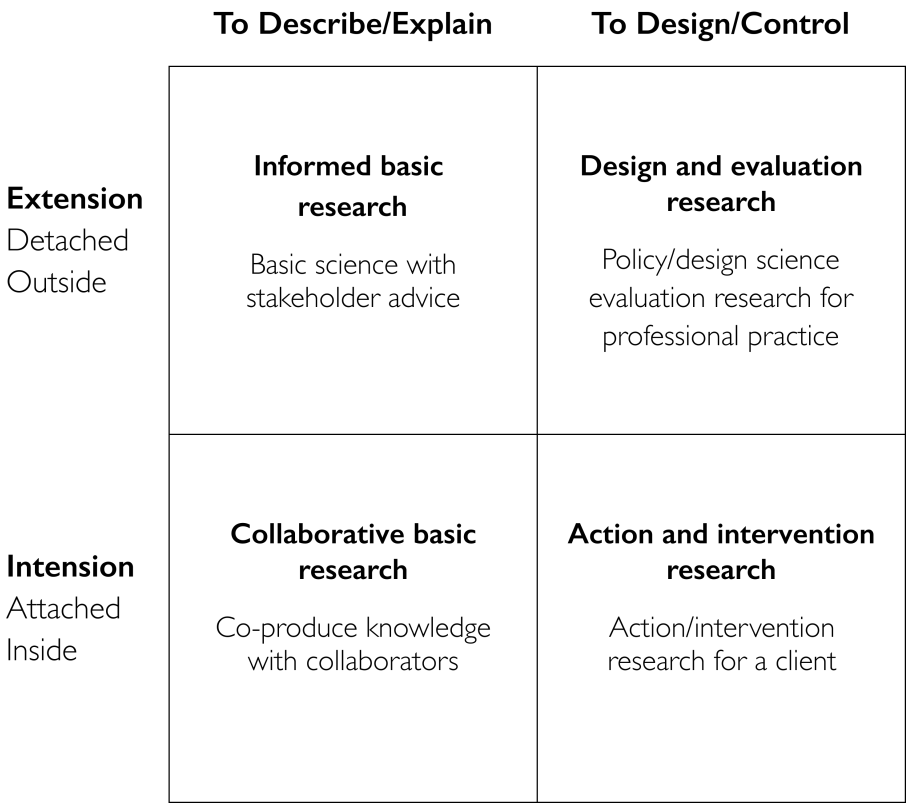

Fig. 4.1: Forms of Engaged Scholarship (From Van de Ven, 2007) p. 27

4.1 The Research Setting for Investigating Digital Transformation

The digital transformation of Danish environmental assessments began in October 2020 and unfolded over three years. The stakeholders consist of 15 public and private organizations, actively participating in the broader innovation project known as DREAMS, www.dreamsproject.dk. These stakeholders represent various organizations, including governmental agencies, regional authorities, civil society, non-governmental organizations, engineering consultants, environmental assessment, artificial intelligence and IS researchers, and project developers. Notably, this multi-organizational venture marks the first initiative to change how information is accessed and communicated in environmental assessment processes within Denmark. This initiative extends across diverse organizations and societal interests, impacting both public and private sectors. As a result of this interdisciplinary collaboration across multiple organizations, this digital transformation emerges as an unusual case (Flyvbjerg, 2006).

In the pursuit of understanding this shared challenge and aligning roles and expectations, engagement was initiated through consultations with the project leader (a leading researcher in environmental assessments) overseeing the digital transformation. Given the multitude of stakeholders in the environmental assessment process, a consensus emerged that the digital transformation should be grounded in a comprehensive understanding of the distinctive characteristics and needs of various stakeholders. To gain a deeper understanding of the practice of environmental assessments, the research leader described the environmental assessment process, providing an initial understanding.

Environmental assessments play a crucial role in the initial phases of planning and designing proposed activities. An environmental assessment is a systematic evaluation of the potential impacts that human activities, projects, or policies may have on the environment. They serve as a means for authorities, the public, and relevant stakeholders to assess the sustainability performance of an activity. The resulting perspective typically outlines conditions to mitigate potential negative impacts and support sustainability (Garigliotti et al., 2023; Miljøministeriet, 2023a,b). Legally mandated, environmental assessments are essential for decisions related to energy supply, transport, construction, and agriculture. The process involves identifying, forecasting, evaluating, and mitigating potential environmental impacts associated with proposed plans, programs, or projects. These activities are thoroughly documented in publicly available environmental assessment reports. Due to the elaborate nature of this process, diverse stakeholders participate, including project developers, engineering consultants, governmental agencies, regional authorities, civil society, and non-governmental organizations, each contributing unique insights to the assessments (Miljøministeriet, 2023a,b). For larger or environmentally significant projects, a more comprehensive environmental impact assessment may be required, further emphasizing the importance and complexity of these assessments (Miljøministeriet, 2023a,b).

4.2 Case Study of Goals in Digital Transformation

Building upon the understanding derived from existing IS literature (see Chapter 2), it is evident that digital transformation typically involves radical (re)defining changes. However, understanding these changes poses persistent challenges, even more so when navigating multi-organizational collaborations. Guided by the project leader's advice, the initial exploration focused on understanding stakeholders' perspectives on change within the context of environmental assessment. Correspondingly, a research question formed: *How can we understand the digitalization goals of different stakeholders in a digital transformation of environmental assessment?*

This inquiry led to the employment of an attached collaborative form of engaged scholarship (as illustrated by the bottom left quadrant in Figure 4.1) to describe and explain the phenomenon that was, at that time, not well understood. This method aligns seamlessly with a case study, described as "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not evident*" (Yin, 1981).

The importance of acknowledging the diverse variants of case study research is recognized in this dissertation. Beyond the single-case study design chosen in this dissertation, case study variants can include multiple case studies, and may even involve quantitative evidence. While the case study conducted in this dissertation is qualitative, it is crucial to distinguish between case studies and qualitative research (Myers, 2013; Yin, 1981). The selection of an exploratory single-case study for this dissertation is based on its suitability for addressing the research question and objectives, allowing for an in-depth investigation of the phenomenon as it develops over time.

To understand the case within its context, workshops were initiated under the guidance of the project leader, with engagement primarily taking an observatory role. These workshops brought together diverse stakeholders, each representing a unique function within the environmental assessment process. The central theme of these workshop sessions was an in-depth exploration of the challenges embedded in current environmental assessment practices, along with how digital transformation could address these challenges.

Motivated by the diverse responses during the workshops and to obtain a more elaborate understanding of the case, ten qualitative semi-structured interviews were conducted to gather empirical data. Preparing an environmental assessment report involves diverse stakeholders, each contributing unique roles, expertise, and insights. To ensure the inclusivity of the empirical data, consultation with a DREAMS project expert and observations from stakeholder workshops guided the selection of two key stakeholders from each stakeholder group for interviews.

The analysis of the interviews included a soft systems methodology approach, chosen for its efficacy in addressing complex problem situations involving multiple stakeholders with conflicting perspectives (Checkland and Scholes, 1999). The soft systems methodology grounded analysis involved creating root definitions representing different stakeholder perspectives leading to a conceptual model. The conceptual model illustrated the structure and dynamics of the environmental assessment process, outlining how stakeholders' experiences within each activity contribute to defining goals. These goals encompassed stakeholders' visions for the evolution of environmental assessment practices. While tailored to the specific context of DREAMS, this analysis helped to understand the relationship between different elements. Notably, it established connections between experiences within activities and the desired changes the stakeholders sought. These connections are particularly relevant in managing diverse yet legitimate goals across multiple organizations.

Employing soft systems methodology as the analysis technique allowed for moving beyond passive observation. Instead, the analysis actively interpreted the data, taking on a proactive role in uncovering underlying relationships and meanings within the perspectives of various stakeholders. Given the participatory nature of soft systems methodology, involving diverse stakeholders in defining and understanding current and envisioned environmental assessment practices, aligns well with the attached collaborative form of engagement adopted in this case study.

4.3 Literature Review of Roadmapping Digital Transformation

Now knowledgeable about the desired changes sought by different stakeholders, a new question emerged: *How is roadmapping used for reimagining organizations in digital transformation literature?* Answering this question requires an understanding of current approaches, which entails conducting a literature review using an individual research method.

In this context, while active engagement remains essential, a separate literature review was included following the guidelines outlined by Templier and Paré (2015). Departing from the active engagement characteristic of engaged scholarship, the engagement with the literature was marked by a shift from the previous observatory and interpretative role to a more analytical and critical one. Temporarily disengaging from the forms of engaged scholarship was necessary to map the current state of knowledge about roadmapping and digital transformation. This literature review was fundamental for identifying five roadmapping frameworks, within which the 28 selected digital transformation papers were positioned.

To explore the role of roadmapping in digital transformation literature, qualitative content analysis was employed. Qualitative content analysis is suitable for identifying themes across diverse texts (Hsieh and Shannon, 2005). In this study, the analysis involved examining 28 selected papers to identify recurring patterns and distinctive themes related to roadmapping within the context of digital transformation. This inductive analysis served as a foundational step in understanding the intersection between two distinct fields – roadmapping and digital transformation. By systematically analyzing the content of the selected 28 papers, this approach allowed for the emergence of insights and patterns, understanding how roadmapping is currently applied within the digital transformation context and positioning its current challenges.

In the context of literature reviews, there are various approaches, including narrative reviews, developmental reviews, cumulative reviews, and aggregative reviews (Templier and Paré, 2015). This literature review emphasizes the current limitations in the IS literature and sets the stage for addressing gaps in knowledge regarding the application of roadmapping in a broader multi-organizational digital transformation context.

4.4 Grounded Theory of Roadmapping Digital Transformation

As a response to the identified limitations in current literature, a research question emerged: *How do practitioners enact roadmapping for digital transformation?* Recognizing the need for an in-depth exploration beyond existing literature, grounded theory, a methodology originally developed by Glaser and Strauss in 1967 was selected. (Glaser and Strauss, 1967). Over time, grounded theory has evolved into three main strands: Classic Grounded Theory or Glaserian grounded theory, Straussian grounded theory, and constructivist grounded theory, as proposed by Charmaz (2006). This methodology proved highly suitable for a research problem with limited prior literature (Orlikowski, 1993; Urquhart, 2022).

The 'how' research question possesses a descriptive characteristic, specifically addressing how the process of developing a roadmap occurs in practice. Correspondingly, the research question guided the engaged scholarship process and proceeded with a detached form of engagement, informed by a basic research purpose (as exemplified by the top left quadrant in Figure 4.1). Detaching from DREAMS allowed for the development of theories with the potential for broader applicability beyond the specific case of this dissertation.

Despite maintaining a detached perspective from DREAMS, the guidance of a key stakeholder proved essential. This form of engagement involved informal discussions with a stakeholder, who had a crucial role in identifying relevant practitioners for interviews. The advice resulted in selecting professionals from six organizations, each expressing extensive experience in roadmapping digital transformations. The interviewees, varied in roles such as consultants, project managers, operations and maintenance managers, and project leads specifically involved in data and digitalization projects, collectively shared their engagement in roadmapping digital transformations. The interviews, designed as semi-structured sessions, were chosen for their flexibility to facilitate an in-depth exploration of participants' experiences and perspectives. Additionally, separate meetings were attended, during which produced roadmaps were demonstrated and explained. Correspondingly emphasis, during the analysis, was on understanding practitioners' view of the roadmapping process and how they leverage that process, specifically in digital transformation projects.

The analytical framework in this study aligns with the methodological principles of Charmazian grounded theory, placing particular emphasis on the interpretive and constructivist nature of knowledge construction, constant comparison, and theoretical memoing during the active construction and refinement of concepts based on evolving insights (Charmaz, 2006). The analysis unfolded iteratively, progressing through distinct stages, including initial coding, focused coding, and theoretical coding. The initial coding stage involved a line-by-line examination of the data, allowing for the identification of categories. Contrary to the expected time estimate, this stage turned out to be more time-consuming, underscoring its critical importance in the overall analysis. Upon reflection, it became evident that the careful coding during this initial stage laid the foundation for the subsequent analytical steps. Subsequently, the analysis transitioned into focused coding, wherein core themes emerged. Notably, this stage revealed two overarching abstract themes, marking an early but deliberate choice in the categorization process. As part of this phase, there was a reconceptualization of codes, accompanied by a simultaneous regrouping of underpinning initial codes. As the analysis progressed, the theoretical coding stage began. This final stage involved describing key concepts, relationships, and the overall theoretical framework that emerged from the data. Crucial for this final stage was visualizing the relationships by connecting quotes to emergent codes as empirical evidence while also incorporating theoretical memoing. The iterative nature of the Charmazian grounded theory methodology was integral to this analytical process, allowing for constant reflection, refinement, and alignment with the emergent theoretical insights.

Regardless of the specific strand of grounded theory adopted, scholars must be reflective about their role. In embracing the principles of Charmazian grounded theory, Charmaz (2006); Urquhart (2022) underscores the significance of the researcher's active engagement in shaping and interpreting the data, recognizing the constructivist nature inherent in knowledge construction within grounded theory.

As open coding is emphasized as a foundational step across all versions of grounded theory, particular interest lies in a thorough examination of this initial key step. While open coding is often perceived as a lengthy and seemingly dull process, it almost always reveals novel and unexpected insights. To ensure a reflective understanding of the first encounter with grounded theory, especially during the stage of open coding, a detached form of engagement with an informed basic research purpose was adopted (as exemplified by the top left quadrant in Figure 4.1).

In a distinctive approach, adopting a dual role as both the researcher and the subject, an interview was conducted about the personal experience with grounded theory. This involved openly coding those experiences, resulting in practical insights and advice for those navigating the open coding process for the first time.

4.5 Action Design Research of Roadmapping Digital Transformation

The grounded theory offered a valuable theoretical explanation for the complex problem of roadmapping a digital transformation. However, a practical question remained: *How can roadmapping support strategizing digital transformation?* Guided by the research question, there was a shift from a detached form of engagement to an attached form (as illustrated by the bottom right quadrant in Figure 4.1). This time, not only observing and explaining but directly intervening in the practical context of DREAMS. A dual role emerged, maintaining closeness with DREAMS while simultaneously creating distance to see things differently and enable change to happen (Coghlan, 2007).

In this regard, it was not challenging to choose action design research as a research design. Action design research is particularly suited for research efforts where practical solutions are needed, and ongoing engagement with stakeholders is crucial for success. Action design research is rooted in design research while using the complementary strengths of action research (Nielsen and Persson, 2016). The dual purpose of action design research is to address real-world problems through the creation of innovative solutions while contributing to the development of theoretical knowledge (Sein et al., 2011). With the context of this study, the purpose was to construct and evaluate a roadmapping method and a roadmap based on backcasting rooted in existing literature (Okada et al., 2020).

In contrast to previous studies, choosing action design research was straightforward given its unique nature with no other variants. Choosing a variant in design science research might have been significantly more challenging, as the literature expresses several variants of this research design (Goldkuhl and Sjöström, 2018).

The study unfolded as a collaborative and iterative undertaking, centered around key activities such as problem formulation, artifact creation, and evaluation. In the initial stages of this research, a critical focus was placed on problem identification through a series of problem formulation meetings. These collaborative sessions served as a forum for engaging with key stakeholders and understanding the complexities of the real-world challenge at hand.

The incorporation of workshops facilitated action, resulting in formalized learning. The empirical data included various sources, including prior data collection, the ten semistructured interviews with DREAMS stakeholders, and interviews conducted with roadmapping professionals external to DREAMS. Furthermore, five roadmapping workshops were conducted within DREAMS and incorporated as additional empirical data. As a closing activity, and as the exit point as a researcher, a collaborative evaluation was arranged, within which the roadmap created was evaluated. The criteria for this evaluation centered on the stakeholders' ability to connect with the roadmap – assessing whether the visualized pathways resonated with all participants and if they could envision themselves within the transformation goals.

The insights gained from the action design iterations were formulated into design principles. Special attention was given to ensuring that these design principles would offer value to practitioners dealing with similar challenges. In this way, it was ensured that the lessons learned were not limited to the context in which they were originally identified, increasing the generalizability of the insights learned (Chandra Kruse et al., 2016).

To comprehend and document the formalized design principles, a narrative approach was adopted. This method allows for the storytelling of how each design principle manifested in practice, preserving the rich contextual background. This authenticity is crucial in action design research (Sein et al., 2011). The practical application of this narrative approach was evident when summarizing the findings. This undertaking involved multiple iterations, with the primary challenge centered around finding a balance between creating a compelling narrative and maintaining the necessary rigor and relevance. This integrated approach allowed for a nuanced exploration of the research findings, capturing both the depth of the narrative and the robustness of empirical support.

4.6 A Practical Framework for Roadmapping Digital Transformation

Up to this point, this dissertation has outlined ways of engaging with the research setting through communication with and learning from stakeholders. However, scholars are encouraged to consider how they communicate their research to bridge the theory-practice gap (Van de Ven, 2007) p. 237. The theory-practice gap signifies a common challenge: scientific knowledge is often not presented in a readily applicable form in practical contexts (Van de Ven, 2007) p. 234. Consequently, it is emphasized that scholars bear the responsibility of specifying how the knowledge they produce should be implemented; otherwise, practitioners may struggle to adopt it.

To cross the theory-practice boundary, the collective insights from the different forms of engagement have been conceptualized as a roadmapping framework specifically tailored for practitioners (as detailed in Chapter 6). This roadmapping framework is grounded in the following propositions. Research findings are more likely to be adopted and diffused when they are perceived as (1) having a relative advantage over the status quo, simple to understand, explicit, and actionable, (2) when they engage and reflect the views of the adopting community and (3) when they are presented in a rhetorically persuasive argument (Van de Ven, 2007) p. 241-242. These propositions form the foundation of the roadmapping framework's structure. Initially, the roadmapping framework is motivated by an emphasis on the necessity of going beyond traditional linear perspectives in roadmapping. Following this, the intended practitioners and premises for adopting this framework are described, followed by an explanation of three core activities within the framework. A visual representation of the roadmapping framework is provided to support this explanation. The framework is designed to be actionable, with each activity description underpinned by practical and rhetorically persuasive examples. These examples draw upon the experiences gained from the research setting, providing a tangible connection between the framework and real-world applications.

The development of this practical framework was primarily centered on communicating research findings and fostering understanding among practitioners. Throughout this process, the framework underwent continuous evaluation concerning its comprehensibility and communication usefulness in collaboration with the supervisors of this dissertation. In this context, my role as a researcher differed significantly from previous instances, involving a far more creative approach. The framework was formulated based on prescriptive and normative statements and further reinforced by empirically grounded examples. Aiming for communication and understanding, a deliberate choice was to move away from merely relying on the traceability of statements to empirical evidence. Instead, the approach was to draw on previous collective work, incorporating it into the framework and establishing linkages with all preceding engagements and insights.

5. PAPERS

As outlined in (Chapter 4), various forms of engaged scholarship were employed to guide the research activities within this dissertation. Insights from these engagements are summarized in five research papers as detailed in (Table 5.1).

[P#]	Publication Information
[P1]	Ashna Mahmood Zada, Peter Axel Nielsen, and John Stouby Persson. 2022. *Setting Goals in a Digital Transformation of Environmental Assessment: A Case Study*. Published in International Working Conference on Transfer and Diffusion of IT (IFIP' 22). https://doi.org/10.1007/978-3-031-17968-6_12
[P2]	Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2022. *Roadmapping in the Digital Transformation Literature*. Published in International Conference on Software Business (ICSOB' 22). https://doi.org/10.1007/978-3-031-20706-8_3
[P3]	Ashna Mahmood Zada, Cathy Urquhart, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping for Digital Transformation: A Grounded Theory*. Submitted to Information Technology and People (Inf. Technol. People' 24).
[P4]	Ashna Mahmood Zada, and Cathy Urquhart. 2024. *Open Coding Qualitative Data: An Essential First Step of Grounded Theory*. To appear in Grounded Theory in Action.
[P5]	Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping a Digital Transformation: An Action Design Research Study of Environmental Assessments*. Submitted to European Journal of Information Systems (EJIS' 24).

Table 5.1: Paper Publication Information

Building upon the forms of engagements outlined in (Chapter 4), this chapter emphasizes the results of these engagements. These forms represent different levels of researcher involvement and interaction with the researched context, offering distinct perspectives on the overarching research question. Each paper contributes a unique viewpoint to exploring roadmapping in multi-organizational digital transformation, collectively addressing the overall research question. The subsequent sections will provide a detailed overview of each paper's findings and its specific contribution to addressing the research objective.

5.1 [P1] Setting Goals in a Digital Transformation: A Case Study

RQ: How can we understand the digitalization goals of different stakeholders in a digital transformation of environmental assessment?

To understand the intersection of digital transformation and environmental assessment, [P1] presents a case study of transformation goals with diverse stakeholders. The information systems literature distinguishes digitalization goals as organizational, social, and technological (Ebert and Duarte, 2018; Reis et al., 2018; Vial, 2019). However, challenges in reaching these goals are not uncommon (Peppard, 2020; Tabrizi et al., 2019; Westerman and Davenport, 2018). [P1] shows that recognizing and managing diverse yet legitimate goals of stakeholders is a significant challenge in the context of multi-organizational digital transformations, distinctly due to a lack of guidance on effective goal management (Askedal et al., 2019).

The research conducted within DREAMS employed qualitative methods, including ten semi-structured interviews and participant observations during stakeholder workshops. Correspondingly, an attached collaborative form of engagement (as explained in Chapter 4) was chosen to gather comprehensive insights from stakeholders. The soft systems methodology by Checkland and Scholes (1999) guided the analysis, leading to the development of a conceptual model of environmental assessment activities and their dependencies. The findings revealed how stakeholders' digitalization goals were shaped by their experiences within each activity. The analysis addresses the intersection of digitalization goals and stakeholder's experiences, recognizing that goal-setting entails considerations such as ownership, responsibility, and accountability for meeting digital transformation objectives.

While the conceptual categorization of goals into organizational, social, and technological perspectives may not be inherently irrelevant, practical implementation reveals complex interconnections among these goals. [P1] acknowledges the challenge of aligning transformational objectives with stakeholders' varied digitalization goals. Managing digitalization goals, considering stakeholders' experiences, and tying goals to specific activities emerge as essential, particularly in multi-organizational contexts with varying stakeholder perspectives.

With a systematic approach to goal-setting in multi-organizational digital transformations, [P1] shows an inherent interconnectedness between goals and experiences. [P1] contributes to the overarching research question by emphasizing the importance of systematically collecting experiences aligned with stakeholder activities to inform digital transformation goals in complex multi-organizational settings

5.2 [P2] Roadmapping in the Digital Transformation Literature

RQ: How is roadmapping used for reimagining organizations in digital transformation literature?

Building upon the identified challenges in [P1], [P2] investigates diverse approaches for achieving goals amidst the organizational struggles inherent in digital transformation. The need for effective strategies (Brown and Brown, 2019; Matt et al., 2015; Parviainen et al., 2017; Reis et al., 2018) is a central concern in the IS literature. Despite this, a well-defined and strategic approach guiding digital transformation remains limited (Carroll et al., 2021; Ribeiro, 2021). In this context, [P2] aims to offer valuable insights and actionable guidance for digital transformation strategies.

To address this need, roadmapping, initially derived from industry as a strategic planning framework, emerges as a promising solution. However, a roadmapping approach tailored for digital transformation is still in its early stages of development (Al-Ali and Phaal, 2019). Consequently, a literature review was initiated to gain insights into the application of roadmapping within the digital transformation literature, following the guidelines outlined by Templier and Paré (2015). Subsequently, a qualitative content analysis (Hsieh and Shannon, 2005) was employed to conduct an inductive analysis of the selected 28 papers. This approach was chosen for its suitability in identifying patterns and distinct themes related to roadmapping within the selected digital transformation literature. As outlined in (Chapter 4) the literature review refrained from direct engagement, adopting a more analytical and critical perspective.

The literature review revealed five types of roadmapping in digital transformation, including Product-Technology, Strategy, Business, Data, and Design. For these five types, three distinct themes of obstacles, opportunities, and context emerged. Obstacles in digital transformation manifest through challenges in strategy formulation, resistance to change, inertia, and a lack of visibility regarding potential benefits, posing significant challenges for organizations. Opportunities, on the other hand, highlight the potential benefits of digital transformation, emphasizing that it goes beyond mere technology adoption and requires substantial organizational change. Lastly, the context underscores the importance of viewing digital transformation beyond its impact on markets, products, and services, extending to encompass broader aspects such as business change, customer orientation, and capabilities. [P2] shows that despite the advancing knowledge of digital transformation over time, organizations undergoing such transformations encounter more difficulties than anticipated.

Understanding the obstacles, recognizing opportunities, and considering the contextual framing through roadmapping approaches offer valuable guidance for supporting the complex process of digitally transforming environmental assessments in a multi-organizational setting. Notably, the lack of visibility of benefits and guidance to realize benefits beyond individual organizations emerged as a central obstacle to digital transformation, providing a potential starting point for advancing practice. [P2] revealed the limitations of current roadmapping approaches targeting digital transformation, identifying only five studies as exceptions. Thus, there is still a need to explore how roadmapping unfolds in the context of multi-organizational digital transformation.

5.3 [P3] Roadmapping for Digital Transformation: A Grounded Theory

RQ: How do practitioners enact roadmapping for digital transformation?

The need for a theoretical viewpoint on roadmapping in digital transformations was emphasized by the identification of a limited number of exceptions in [P2], which addressed roadmapping in the context of digital transformation (Al-Ali and Phaal, 2019; Hajishirzi et al., 2022; Parviainen et al., 2017; Schallmo et al., 2017; Zaoui and Souissi, 2020). Despite extensive theoretical exploration by IS researchers in areas such as strategies, change management, and the role of capabilities (Li et al., 2018; Tabrizi et al., 2019; Vial, 2019), organizations still seek a practical viewpoint to effectively guide their digital transformations (Carroll et al., 2021). With this aim, [P3] focuses on exploring the theoretical foundations of roadmapping – a popular framework to analyze an organization's environment for potential disruptive changes (Kerr and Phaal, 2019, 2022). Using a detached form of engagement, as outlined in (Chapter 4), [P3] explores the process of roadmapping, facilitating the development of theories with potential applicability beyond the scope of this dissertation. The grounded theory approach employed in [P3] involved engaging six organizations, focusing on projects where roadmapping played a central role. Each project involved semi-structured interviews with individuals responsible for roadmapping, complemented by observation notes taken during roadmap presentations. The data analysis followed the Charmazian stages of initial, focused, and theoretical coding (Charmaz, 2006).

The resulting emergent theory offers a distinction between roadmap conceptualization and roadmapping process steps. It explains how various process steps, such as project management and communication tools, levels of abstraction, dynamic linkages, and principles, are integral to roadmap conceptualization. Subsequently, [P3] explores how roadmap conceptualization shapes the roadmapping process steps, including bricolage, asking questions, decision-making, narrative building, and visualization. Through comprehensive insights into the daily practices of practitioners in roadmapping digital transformations, [P3] introduces innovative concepts such as bricolage, crowdsourcing, and the consideration of the 'passage of time,' which are less explored in existing roadmapping literature. Notably, [P3] identifies how participants' nuanced comprehension of time profoundly impacts the conceptualization of roadmaps. Specifically, participants prioritize skills over specific events when planning for events further in the future, suggesting a focus on planning their capacity to act rather than engaging in speculative anticipation of future events.

By exploring the daily practices of practitioners involved in roadmapping, [P3] uncovers nuanced conceptualizations and process steps, enriching our understanding of roadmapping approaches and applications within digital transformations. Grounded in real-world experiences with roadmapping in practice and bottom-up theorizing, [P3] contributes to our comprehension of the processes relevant to the multi-organizational venture aiming to digitally transform environmental assessments.

5.4 [P4] Open Coding Qualitative Data: An Essential First Step in Grounded Theory

RQ: not applicable

Building on the practical experience gathering and bottom-up theorizing explored in [P3], [P4] continues with a reflective analysis of conducting grounded theory, employing a detached form of engagement (as outlined in 4). The methodological experiences derived from applying grounded theory in practice in [P3] offer a nuanced understanding of the challenges and insights encountered during the research process. Specifically, [P4] explores the foundational step of open coding in grounded theory analysis, emphasizing its significance as the initial stage across all grounded theory versions, including Classic Grounded Theory or Glaserian grounded theory, Straussian grounded theory, and Charmazian grounded theory. Open coding involves assigning codes to data line by line (Urquhart, 2022), without preconceptions, allowing for exploratory analysis, and almost always revealing something unexpected. [P4] defines open coding, as known from the textbooks, and explores the first author's experience, reflecting on emotional reactions, challenges, and lessons learned encountered when open coding.

[P4] not only explores the foundational step of open coding in grounded theory analysis but also serves as a space for contemplating the role of the researcher within the theoretical process. Understanding the researchers' engagement in shaping and interpreting the data is imperative. [P4] explains the experiences, emotional responses, and challenges encountered during the open coding stage in [P3].

The reflections presented in [P4] highlight the complex dynamic between the researcher and the data, offering essential context for understanding the development of the theoretical framework proposed in [P3]. Additionally, [P4] demonstrates that, during the open coding stage, a grounded theory researcher must navigate emotional responses, submit to the process, maintain faith in it, and give away control. By placing trust in the process and adopting a relaxed approach, grounded theory researchers allow the data to guide them toward new insights and understandings, crucial for the development of solid grounded theories. As a result, [P4] offers three key takeaways for individuals undergoing and embracing open coding for the first time.

5.5 [P5] Roadmapping a Digital Transformation: An Action Design Research Study

RQ: How can roadmapping support strategizing digital transformation?

While [P3] offered insights into the theoretical foundations for roadmapping in digital transformations, it does not directly translate into actionable guidance for practitioners. The imperative for organizations undergoing digital transformation is to achieve alignment regarding the nature of the change and the necessary paths to take (Al-Ali and Phaal, 2019; Munch et al., 2020). However, such alignment remains a challenge in practice (Hajishirzi et al., 2022; Matt et al., 2015). To support this alignment [P5] explores the practical viewpoints of roadmapping, a flexible process widely employed to support strategic planning (Kerr and Phaal, 2022).

[P5] goes beyond mere observation and explanation, and engages with the research setting through an attached form (as presented in Chapter 4). Correspondingly, [P5] directly intervenes in the practical context of DREAMS, adopting action design research, a methodology well-suited for research efforts requiring practical solutions (Sein et al., 2011). This collaborative action-design research consists of three iterations over three years, emphasizing problem formulation, artifact creation, and evaluation, with action taking the form of workshops. The lessons learned throughout the three iterations were transformed into design principles, aligning with the action design research principle of formalized learning (Sein et al., 2011). The design principles were constructed based on criteria that highlight their actionability, contextual relevance, reusability, comprehensiveness, and ability to provide guidance (Chandra Kruse et al., 2016; Iivari et al., 2021). To offer a comprehensive and contextually rich understanding of each design principle and its practical unfolding, [P5] adopted a narrative approach (Rhodes and Brown, 2005).

The practical implications of [P5] propose three design principles for roadmapping practitioners. Firstly, practitioners are advised to begin by diverging from prior experiences and formulating a digital transformation journey rooted in stakeholder interests, as illustrated in [P1]. Secondly, [P5] shows a shift from a temporal time framing, where activities unfold linearly to understanding time as leading to various benefits, aligning with [P2]. Lastly, [P5] explains how practitioners need to be aware and mindful of potential shifts in perspectives during roadmapping in digital transformations and to explicitly address when these shifts should occur.

In alignment with the overarching research question of this dissertation, the elicited design principles not only offer actionable guidance for practitioners engaged in the digital transformation of environmental assessments but also provide valuable insights and practical approaches to be applied more broadly to navigate the complexities of multi-organizational ventures. These principles may also facilitate the development and implementation of roadmapping strategies across diverse domains within the context of digital transformation.

5.5.1 Summary

Collectively, the five papers significantly advance knowledge of how roadmapping can be applied within the context of multi-organizational digital transformations. Through diverse forms of engagement, each paper offers unique perspectives on roadmapping, providing valuable insights into its facilitation within the digital transformation of environmental assessments.

To summarize, [P1] illustrates, with a systematic approach to goal-setting in the context of multi-organizational digital transformations, an inherent interconnectedness between goals and experiences. [P1] positions the systematic gathering of experiences aligned with stakeholder activities as essential when setting goals in digital transformation involving multiple stakeholders. [P2] explains the current approaches for roadmapping in the broader context of digital transformation, offering insights into how roadmapping can be applied in digital transformation. [P2] also shows the current obstacles to digital transformations, including challenges related to achieving benefits and a need to ensure the visibility of those benefits, beyond individual organizations. [P3] establishes a theoretical foundation for roadmapping in the digital transformation context, offering foundational insights into the roadmap conceptualization and roadmapping process steps that can potentially guide multi-organizational digital transformation ventures. Moreover, [P3] supports the importance of learning from practical experiences and adopting a bottom-up approach to theorizing, providing valuable contributions to the exploration of alternative approaches to digital transformation. [P4] reflects upon the role of the researcher when shaping and creating theory and demonstrates three key takeaways on how to apply grounded theory for the first-time grounded theorist. Lastly, [P5] unfolds three practical design principles essential for roadmapping in the specific context of digital transformation. [P5] offers valuable, hands-on guidance for organizations navigating the complexities of roadmapping digital transformation within a multi-organizational venture.

A common challenge, as identified by (Van de Ven, 2007), is the gap between scientific knowledge and its practical application in real-world contexts. Recognizing this challenge, this dissertation seeks to bridge the theory-practice boundary by uncovering and establishing a practical understanding of roadmapping in multi-organizational digital transformation. As outlined emphasized in (Chapter 4), scholars bear the responsibility of specifying how the knowledge they produce should be implemented; otherwise, practitioners may struggle to adopt it. Upon reflection and drawing from the empirical insights gathered from the digital transformation of environmental assessments and the collection of papers in this dissertation, a distinct contribution is provided – a roadmapping framework demonstrated in upcoming (Chapter 6) tailored for practitioners.

6. ROADMAPPING FRAMEWORK: *MODES OF ASKING*

> Because planning is the guidance of future action, planning with others calls for astute deliberative practice.
>
> From (Forester, 1999) p. 1

This chapter presents a comprehensive roadmapping framework specifically designed for practitioners. It draws upon empirical insights gathered through the multi-leveled engagement with the research setting and the results of the five papers (as summarized in 5). Central to this framework are three key activities, each carefully tailored to address specific aspects of the digital transformation process. Within these activities, *modes of asking* facilitate exploration and understanding. This chapter unfolds not only a guide but a dynamic tool, offering practical insights drawn from real-world scenarios. Centered around the roadmapping process in digital transformation rather than visualizing the roadmap, this provided roadmapping framework emphasizes the importance of understanding and navigating the complexities of digital transformations.

6.1 Roadmapping beyond Tradition

Digital transformation is marked by rapid changes in technology, customer expectations, and market dynamics. Traditional roadmapping, designed for longer planning horizons, may struggle to keep pace with this heightened rate of change. Moreover, the high degree of uncertainty and ambiguity in the digital landscape demands flexible and adaptive roadmaps. Unlike traditional linear paths, digital transformation roadmaps must navigate the complex terrain of multiple stakeholders with diverse perspectives, adding an extra layer of complexity usually not present in roadmapping.

This roadmapping framework is designed specifically for navigating digital transformations involving multi-organizational ventures. The premise for this framework is a workshop format where stakeholders sit in the same room and engage in the same set of activities. It is essential to have a facilitator in place to ensure that the right questions are posed during each activity. However, while workshops serve as the primary forum for collaboration, it is essential to acknowledge that not all information may be uncovered within these sessions. Therefore, there may be occasions when it becomes necessary to gather information outside the workshop environment.

6.2 An Activity Guide for Practitioners

The framework comprises three core activities – Backcasting, Exploring, and Re-orientating – each delivering tailored results to address the complexities of roadmapping in digital transformation. Backcasting involves determining the future vision first and then working backward to identify the steps needed to reach that future. Exploring identifies potential actions and key stakeholders. Re-orientating focuses on the outcomes and value of each change. In the roadmapping framework, deliberative shifting occurs within each activity by moving between modes of asking: why, what, how, when, and who, while transitioning refers to the movement between activities. This distinction ensures a nuanced approach to decision-making within and between the three activities of the roadmapping process.

The Figure (6.1) offers an overview of the activities and their outcomes. While the general guideline is to progress in a clockwise direction, it is essential to recognize that the starting point for each digital transformation is unique and context-dependent. Therefore, this framework also adapts based on the specific needs and circumstances of any multi-organizational venture.

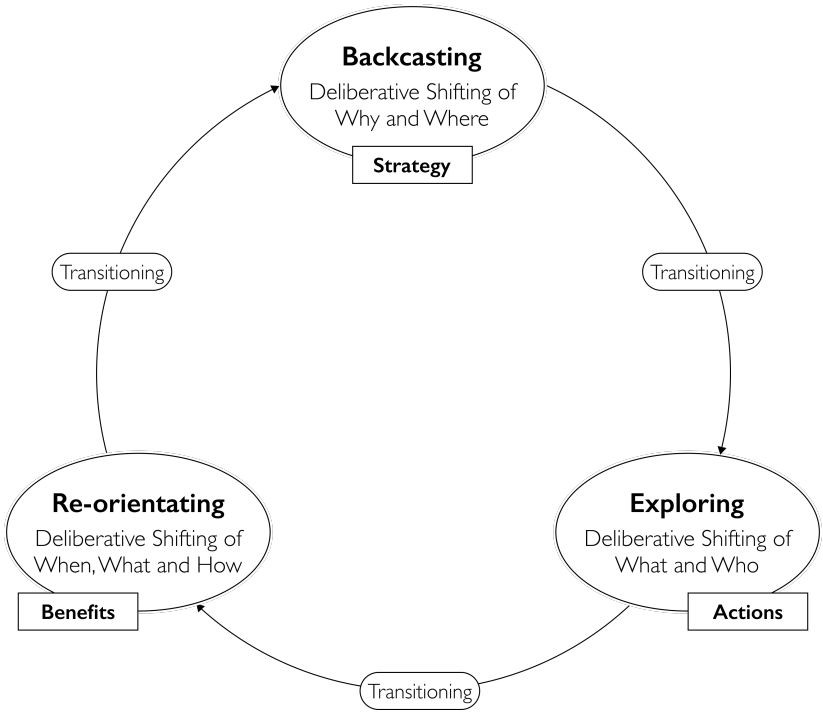

Fig. 6.1: The overall framework for roadmapping in digital transformations. Core activities (in ellipsoids), results (in rectangles), and arrows signifying transitions between activities.

In the upcoming sections, central terms are italicized and demonstrated with examples from a digital transformation venture of environmental assessments, highlighted in bold. A complete overview of central terms is found in (Table 6.1).

6.3 Backcasting: Asking 'Why' and 'Where'

Backcasting is an anticipatory planning technique where the future vision is determined first. To put it simply, backcasting involves questioning the purpose:

- Why this transformation?

Uncovering the 'why' behind digital transformation is crucial as it reveals the fundamental reasons driving the process, a first vision, leading to a shared understanding of the broader strategic objectives. This step is essential because it concerns complex changes and significant commitments, requiring consensus among stakeholders from different organizations.

Example In the digital transformation of environmental assessment, the overarching answer to 'why' was to integrate Sustainable Development Goals (SDGs) into the practice of environmental assessments. This specific example not only articulates the purpose of 'why' but also links it to a broader societal objective, adding depth to the purpose behind the transformation.

Once a consensus is reached about the 'why,' we can consider it as *stabilized*. The next step, according to backcasting, is to ask the question 'where?'. This change in asking marks our first *deliberative shift* from the purpose to the subsequent modes of asking, specifically focusing on:

- Where are we now?
- Where are we going?

Overall, these two questions of 'where' set the stage for the assessment of the current state and the envisioned future. Understanding 'where?', is crucial, as it serves as the initial foundation for an actionable strategy and well-informed decisions during the digital transformation (see Figure 6.2 for an overview).

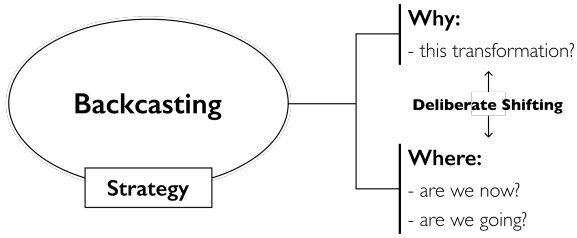

Fig. 6.2: Modes of asking when Backcasting

Example Understanding the current state involved assessing existing processes, technologies, and stakeholder challenges. This assessment occurred in workshops, with stakeholders organized into groups based on their roles. Each group engaged in discussions about their existing practices to answer the question 'where are we now?'. The responses varied, but common issues emerged across stakeholders: lack of easy access to data and reports, highly manual and time-consuming environmental assessment processes, and SDGs not being operational for environmental assessment practices. These challenges were documented as the primary issues or shortcomings in the current state of environmental assessment practices.

Comprehending 'where we are now' is key, as the existing state of processes, technologies, and challenges serves as the foundation for anticipating the changes that digital transformation could bring and, consequently, shaping the direction of the future 'where are we going?'.

Example In the second half of the workshop, stakeholder groups further engaged in envisioning how digital transformation could enhance their environmental assessment practices. Directly addressing the challenges identified earlier, including issues such as scattered data and limited accessibility, the envisioned future materialized with specific goals. These goals involved making previous reports and background data easily accessible and searchable for environmental actors, synthesizing experiences from past reports through data mining, and integrating SDGs into the core of environmental assessments. It was acknowledged that the goals envisioned from the identified challenges collectively lay the groundwork for strategies aimed at the digital transformation of environmental assessment practices.

When roadmapping for digital transformation it is important we actively consider and prepare for multiple possible futures. Rather than committing ourselves to a singular future, we aim to stay agile and prepared to act across multiple potential futures. This commitment ensures that our digital transformation strategy remains flexible, responsive, and capable of evolving in diverse directions as needed.

However, acknowledging change is one thing; effectively navigating and leveraging it is another. Having clarified our 'why' and 'where' and established a stabilized foundation, we need to explore the necessary actions for reaching the envisioned future.

As we transition to exploring, the objective is dual: to explore the actions necessary for reaching our envisioned futures and to strategically keep our future open. This dual approach ensures a comprehensive understanding of the actions needed for immediate progress while maintaining the agility to adapt and seize emerging opportunities. By actively exploring diverse actions, we ensure agility, enabling us to adjust the developed strategy in real time as the landscape evolves.

6.4 Exploring: Asking 'What' and 'Who'

Exploring involves a detailed inquiry into potential actions and identification of stakeholders crucial to the identified transformation strategies. As we transition from backcasting to exploring, a deliberative shift occurs, moving from questioning 'why' and 'where' to focusing on 'what' and 'who' (see Figure 6.3 for an overview). This shift translates broad strategic goals into specific, measurable expectations that align with key stakeholders' diverse needs and aspirations. In doing so, we ensure a more actionable roadmap and better alignment with the dynamic nature of digital transformation.

Asking:

- What is expected of us?

serves as a first step in aligning the roadmapping process with stakeholder expectations and strategic goals. Overlooking this question could detach the roadmap from stakeholders' diverse needs, steering the digital transformation off course. The worst-case scenario is a roadmap in a *state of flux*, which fails to resonate with the diverse expectations within the multi-organization, resulting in a digital transformation of zero value.

Example In recognizing this consideration, we also incorporated stakeholders' expectations for platformization and developing mitigation platforms based on citizen science.

The question, 'What is expected of us?' serves a dual purpose: encouraging stakeholders to identify and communicate their expectations and helping further define actions by translating these expectations into actionable items on the roadmap. This process aligns envisioned futures with the needs and expectations of various stakeholders.

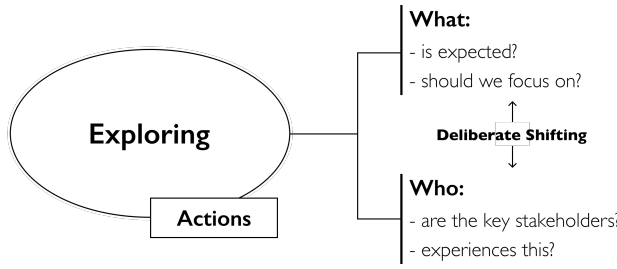

Fig. 6.3: Modes of asking when Exploring

When asking 'what is expected of us?' a sign that we are heading in the right direction is encountering various expectations, some aligning closely, while others offer diverse perspectives. Diverse expectations indicate that we are on the right track toward a comprehensive understanding of the distinctive characteristics and needs across stakeholders.

This understanding can be achieved through various methods, such as interactive workshops where stakeholders share their insights collectively, or through individual interviews that allow for more in-depth exploration of specific expectations. Employing a combination of workshops and interviews ensures a well-rounded approach to uncovering the multifaceted expectations among stakeholders.

Example When asking 'what is expected of us,' we employed a combination of workshops and interviews. For workshops, we included representatives from different stakeholder groups, to discuss expectations. This discussion included aligned expectations such as standardization and governance of data. On the other hand, diverse perspectives emerged, like developing mitigation platforms based on citizen science, using digital twins to better model environmental aspects, and ensuring the integration of SDGs by making it a legal requirement.

The example above illustrates how engaging with diverse stakeholders can reveal commonalities and unique perspectives during the exploring activity, and also form the initial ideas for concrete actions.

To derive at a stabilized 'what is expected of us?' it is necessary to make a deliberate shift from asking 'what' to 'who,' specifically asking:

- Who are the key stakeholders?

Example An answer to 'who are the key stakeholders' included environmental assessment researchers, artificial intelligence (AI) researchers, engineering consultants, data specialists, environmental protection officers, and interaction designers.

Moreover, asking:

- Who experiences this?

provides a nuanced understanding, aligning expectations with diverse experiences and needs of individual stakeholders, and also directly informs the actions outlined in the roadmap. This practical question of 'who' ensures that the digital transformation is a collaborative journey, and the insights gained from stakeholders directly contribute to shaping the roadmap. This alignment facilitates transparent communication, allowing stakeholders to see how their specific expectations are addressed and actively involved in the practical development of the roadmap.

Example Subsequently, it was necessary to group similar expectations into categories to identify common themes and patterns. During this process, we also distinguished between shared expectations that cut across multiple stakeholders and those unique to individual groups. Aligning expectations with individual stakeholders revealed practical challenges and corresponding expectations that translated into actionable roadmap items. For instance, engineering consultants and authorities faced issues with scattered data and limited accessibility. Their expectation was to enhance data accessibility and searchability. Conversely, project developers encountered difficulties obtaining a broader overview of potential risks. Their expectation involved implementing a geographic information system (GIS-based) risk analysis system for better integration of sustainability.

Now that we have aligned expectations with individual stakeholders' experiences, the next step is to prioritize expectations and make a deliberative shift by asking the question:

- What should we focus on?

The question 'what should we focus on?' guides stakeholders' attention to key areas identified during exploration, encouraging stakeholders to prioritize specific aspects of digital transformation, such as technology adoption, process optimization, societal impact, or other critical elements. Letting the stakeholders direct the focus is essential, as it increases their responsibility of enacting the roadmap.

Prioritization can be carried out using a dot method. In this method, stakeholders use 'sticky colored dots' – red, yellow, and green, to indicate their priorities. Typically, red signifies high urgency or critical importance, yellow for moderate significance, and green for lower priority. It is important to note that, in some cases, the dot method may not be necessary if priorities were established when aligning expectations. Regardless, it is essential to verify priorities with stakeholders.

Example We confirmed stakeholders' priorities, ensuring clarity on their focus areas, which primarily centered around technology adoption and societal impact. This verification process provided an additional layer of assurance regarding the identified priorities. Subsequently, these priorities were translated into a more nuanced understanding of three distinct tools. These tools include a repository of existing environmental assessments to centralize information, an open-access baseline tool offering a comprehensive overview of environmental data, and a novel tool providing insights into impacts, mitigation measures, and their interlinkages with SDGs.

Asking 'what should we focus on?' helps in determining which expectations should be prioritized, leading to a stabilized understanding of the key priorities. By navigating stakeholders' expectations and experiences through the questions 'what' and 'who,' we have established the foundation for actionable roadmap items. As we transition to the next activity, re-orientation, our focus shifts to the temporal aspect and expected values of the digital transformation. This involves a deliberative shift towards asking 'when,' 'what,' and 'how'.

6.5 Re-orientating: Asking 'When', 'What' and 'How'

Re-orientating involves assessing the potential benefits of specific actions (see Figure 6.4 for an overview). This assessment is essential for creating a roadmap that goes beyond merely targeting expectations; it focuses on understanding the roles of people and the timing of when their capabilities are required. In doing so, we create a roadmap not only outlining the strategic objectives and actionable expectations but also providing a detailed plan for achieving tangible and valuable benefits, fostering a more effective and outcome-driven digital transformation journey.

To introduce a temporal aspect to the roadmap, we begin by asking:

- When should specific actions be implemented?

Asking 'when should specific actions be implemented?' addresses the timing and sequence of actions to ensure the realization of previously identified expectations. This way of asking allows us to consider the order of actions and accordingly question whether this order is correct.

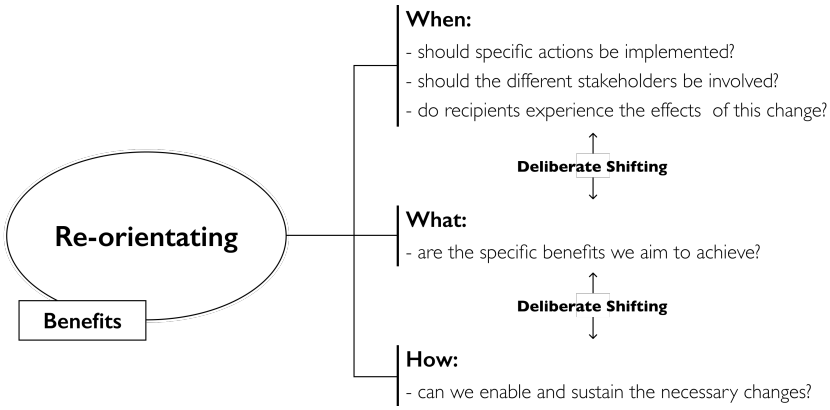

Fig. 6.4: Modes of asking when Re-orientating

When considering this question, it is crucial to contemplate the timing and sequence of actions necessary to fulfill our expectations. Rather than adhering strictly to a linear progression, we should factor in the *dependencies* between various actions. This consideration ensures that the chosen order of actions aligns with the overall effectiveness of the digital transformation.

Example Originally actions were planned as separate work packages. One of the first work packages included creating a framework of key concepts and terms and setting up key data input to structure and develop the digital tools. However, in practice, this did not work. Simply put, the work packages did not account for the dependencies between different actions. When asking stakeholders 'when should specific actions be implemented?' during workshops, it became clear that not everyone agreed with the planned sequence of actions. Instead of starting with the framework, stakeholders preferred to begin with developing the repository of existing environmental assessments. Starting with the repository would provide a foundation for both the baseline tool and the more novel tool by feeding in new environmental assessments. As a result, all tasks related to the repository tool were rearranged.

This example demonstrates the significance of understanding and reaching a stabilized consensus among stakeholders about the sequence and dependencies for more effective implementation during digital transformation. However, to fully comprehend the dependencies between actions, the next step is to ask:

- When should the different stakeholders be involved?

By asking the question 'when should the different stakeholders be involved?' we assess when specific capabilities of stakeholders are required. This examination of capabilities is pivotal for determining the most suitable timing for implementing actions, as specific stakeholders possess valuable insights into the dependencies of actions. The question is equally important to gain a temporal overview of when stakeholders should be engaged to undertake a particular action and assist with their capabilities. How we find these stakeholders will be context-dependent, but typically, someone within the multi-organization can point toward the right person for the job. If this is not the case, considering where to find the right person is necessary.

Example In implementing actions for technology adoption during the digital transformation of environmental assessments, we found that, depending on the tool in question, we needed the capabilities of environmental protection officers and AI researchers. However, when it came to developing a framework to guide the integration of SDGs, the knowledge of environmental assessment researchers was required.

By asking these two questions, we have come to a stabilized understanding of the temporal aspects of the roadmap. Yet, we still need to know when recipients experience the effects of these changes. To be able to answer this question, we first need to know what effects we aim to achieve. As such, we make a deliberative shift from asking 'when' to 'what':

- What are the specific benefits we aim to achieve?

Asking 'what' brings a functional aspect to the roadmap as we focus on the nature of the anticipated benefits and the specific outcomes desired. The reason to include benefits is plentiful. First, benefits act as motivators for stakeholders involved in the transformation. When we understand the positive outcomes we are working towards, it enhances motivation. Secondly, clearly defined benefits create accountability, as specific stakeholders can be held responsible for delivering the expected changes. Lastly, benefits also provide a basis for decision-making throughout the digital transformation journey. When faced with uncertainties, not uncommon as it is a digital transformation, we can refer back to the anticipated benefits to guide decisions and ensure that we are in line with the overarching strategy. Benefits can come in various types, such as operational, financial, strategic,

technological or social, and environmental. These categories are not mutually exclusive, and the actual benefits realized in a specific context can often span multiple categories. When discussing benefits, stakeholders should begin by clearly specifying the type of benefit and then provide detailed elaboration for better clarity and context.

Example When defining the benefits of each tool, we found benefits of varied types ranging from operational, financial, technological, strategic, social, and environmental. Operational benefits included increased efficiency and more democratic processes. Financial benefits were mainly tied to cost savings and cost reductions. These benefits were all realizable due to the technological benefits, which focused on technology adoption and innovation.

Once we have outlined the different types of benefits, we need to specify them further. This specification requires a deliberative shift back to 'when,' now asking:

- When do recipients experience the effects of this change?

Asking about the timing 'when' not only helps in specifying when a particular benefit will be achieved but also requires identifying the recipients of those benefits, thus providing additional clarity and detail.

Example By asking about the timing 'when,' we connect defined benefits with when recipients experience them. The public benefits last by gaining easier access to assessment data and better communication about the impacts of the green transition to decision-makers. In the second year, project developers benefit from quicker overviews, leading to earlier integration of environmental considerations and cost savings. Engineering consultants and authorities see improved support in the third year, including enhanced data visibility and better alignment with SDGs.

To move forward, we must not only identify the benefits but also outline the practical steps needed to achieve them, which involves understanding how to enable and sustain change. This requires a deliberative shift in focus towards the procedural aspect, asking the question 'how':

- How can we enable and sustain the necessary changes?

Asking 'how' these benefits will be practically achieved through enabling and sustaining changes, ensures that the roadmap is aspirational and also practically executable. When asking 'how' we distinguish between two types of change: enabling and sustaining changes. Enabling changes are temporary adjustments essential for initiating the change process while sustaining changes are permanent alterations necessary for realizing long-term benefits and may involve modifying existing practices, processes, or relationships. Understanding and addressing both types of change is crucial when roadmapping in digital transformation, as it allows for the successful implementation and long-term effectiveness of the proposed initiatives.

Example An enabling change in the environmental assessment domain involves negotiating the selection of APIs and data types. This process facilitates the integration of advanced technologies, allowing for improved data interoperability and streamlined information exchange. The sustained impact of these negotiations becomes evident as they lay the foundation for the adoption and integration of innovative tools and technologies. These tools contribute to the broader digital transformation of environmental assessment practices, ensuring long-term efficiency and comprehensiveness in assessments.

By asking 'when,' 'what,' and 'how' we have ensured that the resulting roadmap, besides outlining the strategic objectives and actions aligned with stakeholders' expectations and experiences also provides a detailed plan for achieving tangible and valuable benefits. As a result, we have developed a more effective and outcome-driven approach to digital transformation.

6.6 The Iterative Nature of Roadmapping

By now, we have identified a strategy, actions, and benefits for the digital transformation by transitioning between the three activities: Backcasting, Exploring and Re-orientating, and deliberative shifting between modes of asking: why, where, what, who, when, and how. A general recommendation is to keep transitioning between activities and modes of asking until a stabilized consensus is achieved. For a complete overview of central terms when roadmapping in digital transformation (see Table 6.1).

Central term	Definition
Backcasting	The activity of determining the future vision first, and then working backward to identify the steps needed to reach that future
Deliberative shifting	The coordinated act of asking to change perspective
Stabilizing	Moving from a state of flux, to consensus among stakeholders. A state of flux is a condition open to negotiation and interpretation, marked by a lack of consensus or stability. It often feels like going nowhere, and can therefore prompt a shift in modes of asking
Exploring	The activity of exploring potential actions and identification of key stakeholders relevant to the digital transformation goals
Re-orientating	The activity of assessing the potential benefits of specific actions
Dependencies	The relationships between different actions within the digital transformation process. The dependencies highlight how the implementation or completion of one action may be dependent upon, or influence, the execution or completion of another

Table 6.1: Central terms when roadmapping in digital transformation

7. DISCUSSION

Since the beginning of this dissertation, the primary focus has been on understanding roadmapping in digital transformation. Correspondingly, the research question asked was:

What roadmapping practices can support a multi-organizational venture to digitally transform environmental assessments?

The objective has been to explore the extent to which roadmapping can offer guidance within the complexities of a digital transformation of environmental assessments. Informed by insights gained from the multi-leveled engagement within the digital transformation of environmental assessments, this dissertation reveals that a distinctive characteristic of roadmapping in multi-organizational digital transformations is its deliberative practice. While the concept of deliberative practice was demonstrated previously (see Chapter 6), the subsequent section explains it further through three roadmapping practices. These roadmapping practices support multi-organizational ventures in digital transformation and include (1) inductive experience gathering, which is instrumental to the deliberation of goals and processes, (2) deliberative shifting, which helps reconcile competing perspectives, and (3) articulating capabilities, which helps reorient the temporal framing. Each practice is substantiated by empirical evidence from the papers (presented in Chapter 5) and the roadmapping framework (demonstrated in Chapter 6). Before further elaborating on these practices and contextualizing them within related literature, the next section will explain how roadmapping in digital transformation is shaped by the practice of deliberation.

7.1 Roadmapping in Digital Transformation: A Practice of Deliberation

The environmental assessment process involves many different groups, like experts, policymakers, and the public. Each group has its views, interests, and knowledge. From the outset, this dissertation emphasized that the success of digital transformation in this domain depends on understanding the distinctive characteristics and needs of the various stakeholders involved (see Section 4.1). An essential aspect of this understanding involves engaging stakeholders in the planning process. In this context, roadmapping emerged as a valuable tool, defined as a "*a method of inquiry and the application of a temporal-spatial structured strategic lens*" (Kerr and Phaal, 2022). Roadmapping facilitates collaborations across disciplines and encourages participatory planning processes, as highlighted in [P2]. However, the literature review in [P2] also revealed that a specifically tailored approach for digital transformation is still in its early developmental stages (Al-Ali and Phaal, 2019). Despite this, the aspiration to perceive challenges and future opportunities through the varied lenses of diverse stakeholders is a common goal within the domain of planning (Forester, 1999) and within the context of multi-organizational change (Rose et al., 2018).

As an emergent finding from the multi-leveled engagement, this dissertation found resonance in deliberative practice, "*which emphasizes careful exploration to learn about ends, and a subtle but real recognition of other parties*" (Forester, 1999) (p. 86). While deliberative practice is originally focused on democratic deliberations, this dissertation elaborate on and confirms its application in the context of roadmapping in multi-organizational digital transformation. Framing the digital transformation of environmental assessments as a democratic process and actively engaging multiple stakeholders, including the public, in decision-making processes aligns with legal and regulatory frameworks guiding this transformation. This alignment ensures inclusivity, transparency, and accountability – essential components of a democratic decision-making process. Consequently, deliberative practice captures the nuanced interplay between *reflection and action* inherent in the practitioners' collective engagement when digitally transforming, emphasizing that practice involves varying degrees of deliberation but consistently entails action.

The subsequent sections will explain the identified roadmapping practices, providing a comprehensive understanding of the challenges emphasized in existing literature (as detailed in Chapter 2), their origins as evidenced across the papers, and their relevance to the broader literature, thereby identifying key contributions.

7.1.1 The Roadmapping Practice of Inductive Experience Gathering

As explained in (Chapter 2) the importance of initiating digital transformations with a clear vision and a well-defined goal (Bucy et al., 2016; Chanias et al., 2019; Krey, 2021; Peppard, 2020) has been emphasized across the IS literature. Yet, the current understanding of this initial step, particularly in determining a goal, remains limited, emphasizing the importance of providing more guidance for achieving shared goal development among stakeholders (Matt et al., 2015; Rose et al., 2018).

In [P1], this dissertation found that digital transformation goals can be divided into broader and more abstract perspectives: organizational, social, and technological (Ebert and Duarte, 2018; Reis et al., 2018; Vial, 2019). From an organizational standpoint, goals often revolve around the development of new business models and the creation of value through innovation (Ebert and Duarte, 2018). On a social level, goals may prioritize improving individuals' quality of life and societal well-being (Reis et al., 2018; Vial, 2019). Additionally, technology itself is often considered a goal, as its effective use is fundamental to organizational survival and competitiveness (Reis et al., 2018). Expanding upon these perspectives, Parviainen et al. (2017) proposed three additional lenses through which goals can be viewed: internal efficiency, external opportunities, and disruptive change. Alternatively, goals can be identified based on the strategic roles of information technologies, including automation, informate-up, informate-down, and transformation (Vial, 2019).

While this conceptual division of goals provides a useful framework for understanding digital transformation objectives, this dissertation found how its practical application often presents complexities and challenges. Despite the apparent distinctions between these perspectives, real-world goals and experiences are deeply interconnected, posing difficulties in navigating between them (as exem-

plified by [P1]). For instance, [P1] identified the goal of implementing a collaborative content management system for the (re)writing activity in the creation of an environmental assessment. While this goal aligns with the automation perspective identified by Vial (2019), this dissertation found how it also intersects with social, organizational, and technological perspectives outlined by Ebert and Duarte (2018); Reis et al. (2018); Vial (2019).

In this dissertation, the goal-setting process for the digital transformation of environmental assessments started with questioning and refining the overarching vision, rather than adopting abstract goals (demonstrated by [P1]). This approach set the stage for a more purposeful and strategic transformation journey. [P1] demonstrated how systematic experience gathering was instrumental in understanding stakeholders' diverse goals. Correspondingly, [P1] helped understand how *the practice of inductive experience gathering serves as a foundational approach, rooted in the experiences of stakeholders affected by and influencing the digital transformation*. This practice emphasizes the importance of learning from stakeholders' practical experiences as essential for guiding multi-organizational digital transformations (as shown in [P1]).

To examine existing roadmapping approaches in digital transformation, an extensive literature review was undertaken [P2]. This review indicated a significant lack of readiness for digital transformation and revealed limited awareness within IS research regarding roadmapping's use in navigating such transformations. Specifically, the review identified five exceptions to the established roadmapping process in digital transformations. Among these exceptions, two were developed through a bottom-up approach (Al-Ali and Phaal, 2019; Parviainen et al., 2017), while the remaining three relied on literature reviews and were confined to an internal business perspective (Hajishirzi et al., 2022; Schallmo et al., 2017; Zaoui and Souissi, 2020).

With the intention of contributing to the limited bottom-up theorizing of roadmapping in digital transformation, grounded theory was employed [P3]. In [P3], the use of inductive experience gathering provided insights into how roadmappers approach digital transformation projects, uncovering how roadmap concepts translate into practical steps. Specifically, [P3] revealed the dynamic relationship between roadmap conceptualization and process steps. Without the use of inductive experience gathering, the prevalent practice of bricolage among roadmappers, as identified in [P3], might have gone unnoticed. Participants, who drew from diverse professional knowledge, were particularly clear about their eclectic approach, emphasizing the incorporation of elements from project management and agile methodologies. This adaptive and novel roadmapping process step, often described as 'dreamed up ourselves,' illustrates the flexibility and creativity inherent in the application of bricolage.

These insights combined emphasize how inductive experience gathering not only reshapes current perspectives on sustaining and effectively managing goals in multi-organizational digital transformation [exemplified in P1] but also proves essential for deliberating processes (as demonstrated by [P3]).

Contribution to Related Literature

Based on the insights from notably [P1 and P3], this dissertation suggests that (1) the roadmapping practice of inductive experience gathering is instrumental to deliberation of goals and processes in a digital transformation. The following paragraphs will relate this practice to existing IS and roadmapping literature, particularly focusing on contributions to goal development and the evolution of roadmapping processes.

Building upon the challenges outlined (see Section 2.3), the suggestion of inductive experience gathering is a practical response to the persistent challenge of recognizing and navigating stakeholder goals. Therefore, this practice recognizes the challenge of diverse goals and suggests a methodological solution for guiding goal development in multi-organizational digital transformation. The roadmapping practice of inductive experience gathering challenges the conceptual division of goals into abstract and broad perspectives as suggested by Ebert and Duarte (2018); Reis et al. (2018); Vial (2019). Instead, this dissertation proposes that understanding stakeholders' diverse goals through the process of inductive experience gathering and linking these goals to specific activities (as illustrated by [P1]). Inductive experience gathering for goal development improves traditional approaches by targeting the risk of formulating abstract and overly broad digitalization goals, which may become detached from stakeholders' activities and experiences, leading to digital transformations failing to reach their intended goals (Peppard, 2020; Tabrizi et al., 2019; Westerman and Davenport, 2018). Inductive experience gathering focuses on integrating stakeholders' practical experiences, enhancing our understanding. This approach broadens the perspective on goal deliberation, complementing the findings of Parviainen et al. (2017), who suggests that defining goals includes evaluating various scenarios. Inductive experience gathering emphasizes incorporating stakeholders' experiences. This practice makes the process more inclusive and potentially uncovers goals not immediately evident through traditional assessments, like scenarios. Consequently, this dissertation suggests that goals should not only be defined through the evaluation and assessment of scenarios, but also be informed by the practical experiences of those involved in, affected by, or influencing the digital transformation process. This approach brings nuanced insights, engagement, and context that may not be fully captured in traditional approaches like scenario-based analysis, thus complementing and extending the propositions by Parviainen et al. (2017).

Building upon the principles of participatory approach and bottom-up theorizing, this dissertation propose a shift in defining processes for roadmapping in digital transformation. Traditionally, the process of defining goals within the roadmapping literature has been limited to a singular question: 'where do you want to be' (Al-Ali and Phaal, 2019; de Souza et al., 2020; Kerr and Phaal, 2022; Munch et al., 2020). However, the introduction of inductive experience gathering suggests a shift towards a more participatory approach, aligning seamlessly with the collaborative and inclusive principles already inherent in roadmapping. By involving stakeholders directly in the process and gathering insights from their experiences, this approach informs the definition of goals in a more practical and nuanced manner. Leveraging methodologies like soft systems analysis, this dissertation extends beyond the traditional singular question of 'where'. Moreover, this dissertation goes beyond

the limited bottom-up theorizing and internal business perspectives adopted by Hajishirzi et al. (2022); Schallmo et al. (2017); Zaoui and Souissi (2020). Instead, it embraces inductive experience gathering and bottom-up theorizing as instrumental in formulating roadmapping processes in digital transformations. Grounded theory methodologies are especially encouraged in this approach, offering a more comprehensive understanding of the complexities involved.

Expanding upon the discussion of inductive experience gathering, it is worth noting its similarities and departures from traditional methods like backcasting (Okada et al., 2020). Backcasting, similar to inductive experience gathering, involves determining the future vision first and then working backward to identify the steps needed to reach that future the vision. However, while backcasting provides a clear vision and strategic direction, inductive experience gathering takes a different approach. Instead of focusing solely on the future outcome, inductive experience gathering concentrates on understanding stakeholder experiences to develop nuanced and contextually rich goals. Unlike backcasting's structured process involving logic tree analysis and scenario-driven storyline development, inductive experience gathering emphasizes the deliberation of goals within the dynamic context of multi-organizational digital transformation ventures. This contrast highlights the complementary nature of both approaches and that suggests the potential for a more dynamic and purpose-driven goal development by combining traditional backcasting with inductive experience gathering (as demonstrated in this dissertation in Chapter 6).

7.1.2 The Roadmapping Practice of Deliberative Shifting

Previously, in this dissertation (see Chapter 1), it was emphasized that the digital transformation literature lacks practical guidance for navigating complex multi-organizational collaborations (Askedal et al., 2019). This gap is problematic, especially considering the prevalent involvement of multiple organizations in contemporary digital transformation efforts (Rose et al., 2018).

To address this observed gap, a literature review [P2] was initiated to explore the extent to which roadmapping can serve as guide to digital transformation. As part of this exploration, three distinct themes – obstacles, opportunities, and context – were identified within the digital transformation literature (shown by [P2]). Notably, within the first theme, 'obstacle,' the digital transformation literature reveals that inter-organizational digitalization efforts often involve dynamic and, at times, random combinations of stakeholders with diverse goals and motives, which may not necessarily align with an organization's actual interests (seen in [P2]). This finding underscores a significant challenge in multi-organizational digital transformation – effectively managing the diverse and sometimes competing interests of stakeholders. Curious about competing perspectives within the studied research setting, and building on the understanding that "*conflicts are a natural part of human interaction*", especially in settings with multiple groups (Bar-Tal, 2000), the subsequent exploration within this dissertation addresses the identified competing perspectives inherent in the process of digitally transforming environmental assessments.

This examination has revealed several competing perspectives, with two manifesting notable influences. The first perspective revolves around leveraging technology for efficiency improvements in an existing resource-intensive environmental process. In contrast, the second perspective emphasizes the motivation for increased democratic participation in the environmental assessment process. Both perspectives are intricately linked to the stakeholders' goals, revealing conflicting priorities between the pursuit of technological efficiency and the promotion of democratic participation in the assessment process. Importantly, the roots of these competing perspectives extend beyond stakeholders' competencies, encompassing their individual interests in engaging with the digital transformation of environmental assessments. For example, AI researchers, motivated by their expertise and obligations, tend to prioritize the development of technology-centric roadmaps (as evidenced in [P5]). This dualistic dynamic underscores the complex challenge of reconciling efficiency objectives with democratic values within the domain of environmental assessment.

These empirical insights emphasize how competing perspectives are shaped by the context and the diverse stakeholders who are both involved in and affected by the digital transformation. To effectively navigate these competing perspectives, this dissertation advocates for the adoption of deliberative shifting when roadmapping in digital transformation. Deliberative shifting is defined as the intentional and coordinated act of changing perspectives through asking and negotiation (as demonstrated in Section 6 and elaborated in [P5]). Whether prompted by a sense of stability or a lack of consensus, this practice aids in reconciling competing perspectives and facilitates a more 'stabilized' digital transformation.

Contribution to Related Literature

Drawing from empirical evidence from [P2, P5 and Chapter 6], this dissertation suggests that (2) the roadmapping practice of deliberative shifting helps reconcile competing perspectives in a digital transformation. This practice not only aligns with established literature but also introduces a dynamic and responsive approach, offering a nuanced perspective to bridge competing perspectives in multi-organizational digital transformations. The subsequent paragraphs will explain the correlation between this practice and existing IS and roadmapping literature, particularly focusing on contributions to managing competing perspectives and addressing challenges in roadmapping frameworks.

As detailed (in section 2.3), unaddressed competing perspectives pose dual risks: restricting collaboration and heightening competition among stakeholders. Such situations can lead to stakeholders feeling neglected or undermined (Jarzabkowski et al., 2013; Soh et al., 2019). This dissertation reaffirms the significance of acknowledging and addressing competing perspectives, where factors such as plurality of viewpoints, resource constraints, and change contribute to conflicts (Soh et al., 2019). To navigate these perspectives effectively, a combination of defensive and receptive managerial responses is proposed (Soh et al., 2019). Receptive responses entail adopting a 'both-and' approach similar to ambidexterity, an ability emphasized by Vial (2019). Receptive responses involves actively engaging with both sides of competing perspectives to seek mutual adjustment and assimilation.

By identifying and introducing deliberative shifting, this dissertation builds upon existing solutions for managing competing perspectives.

While recognizing the risks and complexities associated with competing perspectives in digital transformations, this dissertation also acknowledges the need for comprehensive strategies to navigate such perspectives. The current literature on roadmapping presents significant challenges, particularly in addressing the complexities arising from micro, macro, and meso perspectives, each serving distinct purposes (de Souza et al., 2020; Kerr and Phaal, 2022; Simoes Freitas et al., 2022). This framework often leads to ambiguity regarding whether roadmapping should begin with a macro, meso, or micro perspective, resulting in conflicting answers (Kerr and Phaal, 2019; Simoes Freitas et al., 2022). Notably, the literature lacks clear guidance on effectively navigating between these perspectives and addressing their interconnections, primarily focusing on information provision at different managerial levels (Simoes Freitas et al., 2022). This identified gap emphasizes the need for a comprehensive approach capable of navigating across micro, meso, and macro levels. The introduction of deliberative shifting by this dissertation acts as a practice to address these challenges and provides a novel framework for navigating existing roadmapping perspectives.

In addition to Askedal et al. (2019); Forester (1999), this dissertation contributes by identifying and elaborating on the concept of deliberative shifting. This dissertation not only confirms the relevance of deliberative shifting within the context of roadmapping in digital transformation but also offers a practical framework for managing the complexities of multi-organizational digital transformation ventures. The roadmapping practice of deliberative shifting introduced in this dissertation serves as a guiding principle for reconciling competing perspectives in digital transformations. As explained in (Section 2.3), the concept of reconciliation in digital transformation has been previously recognized by Ananjeva (2023). This dissertation affirms its relevance and extends its applicability to roadmapping. Furthermore, it introduces and elaborates on nuances of reconciliation through concepts of 'stabilizing' and 'state of flux' as stages in the reconciliation process (see Chapter 6). These concepts, already discussed in organizational behavior, change, and strategic management literature, are logically extended to the context of digital transformation, reflecting the challenges and dynamics inherent in such processes (Hanelt et al., 2021).

7.1.3 The Roadmapping Practice of Articulating Capabilities

The evolution of benefits realization literature since the 1990s has significantly enhanced our understanding of deriving value from initiatives (as demonstrated in Chapter 2). However, a noticeable gap persists, particularly regarding the applicability of these developed methods to the context of multi-organizational digitalization efforts (Askedal et al., 2019). This limitation becomes evident when considering that the benefits of such efforts extend beyond individual organizations to impact societal levels (Askedal et al., 2019). The complexity of benefits realization within a multi-organizational context is increased due to the diverse strategic starting points of the involved entities (Askedal et al., 2019). Supporting this argument, [P2] revealed how obstacles to benefits realization may be intricately linked to navigating internal challenges within the context of digital

transformations (Chanias et al., 2019; Leonardi, 2020; Peppard, 2020). These internal barriers, inherent to organizations undergoing transformation, are commonly categorized into inertia – indicating the absence of necessary resources and capabilities, and resistance to change (Vial, 2019). Resistance often arises from limited visibility of the potential benefits associated with new software (Hajishirzi et al., 2022; Pora et al., 2020; Vial, 2019; Westerman and Davenport, 2018). This internal dimension adds a layer of complexity to the benefits realization process, emphasizing the need for a nuanced approach to addressing internal challenges within each participating organization.

Integral to the discussion of benefits is the perspective of time (Askedal et al., 2019; Vial, 2019). In understanding roadmappers' approaches to mapping in digital transformation, [P3] provided empirical evidence of how time influences planning. Across practitioners in [P3], the value of articulating capabilities for the future was emphasized, rather than planning specific actions for the future, given the dynamic nature of digital transformation (as defined in [P3]).

While [P3] proposed alternative perceptions of time beyond a linear understanding, roadmapping in DREAMS still necessitated linking activities to time (shown in [P5]). Building on the insights from approaches (found in [P3]), the emphasis lies not solely on targeting actions or activities, but rather on the roles of individuals and the timing of their capabilities. This approach ensures that time, resources, and efforts are directed toward achieving specific goals. In [P5], the connection between activities and time was established by assessing the potential benefits of specific activities. In the context of this dissertation, the concept of articulating capabilities represents a significant shift for practitioners. It urges them to move beyond the traditional chronological understanding of time, where activities unfold sequentially. Instead, practitioners are encouraged to recognize the nuanced roles of individuals and the timing of their capabilities, which ultimately leads to distinct benefits (as evidenced in [P3 and P5]). This practice is further elaborated on as the activity of re-orienting, (as demonstrated in Chapter 6).

Contribution to Related Literature

Building upon the understandings from [P2, P3, P5 and Chapter 6], this dissertation suggests that (3) the roadmapping practice of articulating capabilities for realizing benefits helps reorient the temporal framing of a digital transformation. The subsequent paragraphs will explain the correlation between this suggested practice and existing IS and roadmapping literature, specifically addressing contributions to benefits realization in multi-organizations and temporality.

This practice extends existing IS literature by addressing the challenges in benefits realization for multi-organizational digitalization efforts. This dissertation reaffirms the relevance of benefits in roadmapping for digital transformations, as already emphasized by Peppard (2020), while also extending propositions to overcome challenges in benefits realization identified by Askedal et al. (2019) (see Section 2.3). To address concerns about the limited visibility of potential benefits associated with new software (Hajishirzi et al., 2022; Pora et al., 2020; Vial, 2019; Westerman and Davenport, 2018), [P5] proposes incorporating an 'Environment' column within the roadmap. This

proposed 'Environment' column acts as the relationships between benefits and when stakeholders could expect results, contributing to the roadmapping literature. Traditionally, roadmapping literature addresses columns related to technologies, markets, and products, as seen in product-technology roadmapping or extended with business, skills, and organizations, as seen in strategic roadmapping (Phaal, 2004; Phaal and Muller, 2009). With this proposed column, this dissertation enhances the understanding of how benefits are interconnected with the temporal aspects of digital transformation initiatives, providing insights that can inform more effective roadmapping practices.

Transitioning to the exploration of temporality in IS, this dissertation critiques the prevailing 'linear clock' interpretation of time. As outlined earlier, the concept of 'thinking in time' is essential in understanding digital transformations (Baygi et al., 2021). Shifting from conventional, linear ways of thinking about time, a contemporary vocabulary emphasizes concepts such as 'timing,' 'attentionality,' and 'undergoing' (Baygi et al., 2021). This contemporary vocabulary emphasizes the need for challenging linear boundaries and, instead, focusing on timing, sensing new possibilities, and actualizing them (Baygi et al., 2021). This dissertation aligns with Baygi et al. (2021), confirming the applicability of a more flow-oriented interpretation in roadmapping for transformative environments. This dissertation suggests a shift in the temporal framing of digital transformation by emphasizing the articulation of capabilities for future actions rather than rigid planning for specific events. This shift supports the need for a more dynamic and adaptable approach in navigating the temporal complexities of digital transformations (O'Connor et al., 2023).

The roadmapping practice of articulating capabilities for realizing benefits provides a nuanced approach, focusing on the timing of organizational capabilities necessary to bring about envisioned benefits. By emphasizing the identification and development of capabilities required for benefits realization, this practice extends beyond planning through a restrictive 'linear clock' interpretation. Furthermore, incorporating the concept of viewing time as a series of transitions (as detailed in Chapter 6 and in [P5]) adds a practical dimension to the roadmapping framework. This view recognizes the dynamic nature of digital transformation and provides a tangible approach to navigating the evolving environment by considering time as a sequence of transitions between activities rather than adhering to a static progression (see Chapter 6, Figure 6.1).

To summarize, this dissertation advances the concept of deliberation within roadmapping in digital transformation. This concept is operationalized through the roadmapping framework (see Chapter 6) and translated into practical application through three novel roadmapping practices. These practices are (1) Inductive experience gathering, which is instrumental to the deliberation of goals and processes; (2) Deliberative shifting, which facilitates the reconciliation of competing perspectives; and (3) Articulating capabilities, which reorients the temporal framing of digital transformation. These practices collectively explain how to navigate the complexities of multi-organizational digital transformation ventures.

7.2 Limitations

The pursuit of knowledge is a complex journey marked by discoveries, yet it is equally characterized by the acknowledgment of limitations. Therefore this dissertation is not without limitations.

At the outset of this dissertation, the unusual case (Flyvbjerg, 2006) of the digital transformation of environmental assessment was presented as a first initiative to change how information is accessed and communicated during environmental assessment processes. This initiative spans diverse organizations and societal interests, affecting the public and private sectors. While this unusual case has contributed to valuable insights into the field of IS, limitations arise from its specific scale and scope. Specifically, the extent of transferability and generalizability (Myers, 2013; Van de Ven, 2007) for the practices and roadmap method proposed in this dissertation remains to be demonstrated.

In the context of engaged scholarship, consistent and multi-leveled engagement with the research setting was pursued. A notable challenge to digital transformation is resistance to change, manifesting as the opposition shown by employees when new technologies or strategies are introduced within the organization (Matt et al., 2015; Vial, 2019). Despite the recognized challenge, the digital transformation of environmental assessments has commonly been perceived as an opportunity to enhance sustainability and foster public engagement, with little consideration given to challenging that assumption.

Existing roadmapping literature has suggested the advantages of incorporating the roadmapping process into a well-structured roadmap, particularly for evaluating the maturity and articulation of existing strategies with an emphasis on the diagnostic feature of roadmapping (Kerr and Phaal, 2022). However, this dissertation has predominantly focused on the process of roadmapping in the context of multi-organizational digital transformation, there exists an opportunity to broaden the scope to include a more thorough exploration of the roadmap structure.

In the discussion, it was emphasized that the digital transformation of environmental assessments encompasses components of a democratic decision-making process. It actively involves multiple stakeholders, including the public, and aligns with legal and regulatory frameworks guiding the transformation. While the digital transformation of environmental assessments included both ideals of improving efficiency and public engagement (Rose et al., 2015), the focus has predominantly been on the efficiency ideal.

7.3 Future Directions

The previous limitations identify opportunities for further research and exploration within the IS field, laying the groundwork for future investigation and expansion of knowledge. In terms of transferability and generalizability, it would be insightful to explore whether the practices and roadmap method proposed in this dissertation can be applied in other contexts. While the contributions within this dissertation are limited to the digital transformation of environmental assessments,

potential domains for transferability could include areas such as cybersecurity, healthcare, or other fields undergoing digital transformation.

Considering the central challenge of resistance to change, this dissertation could have questioned the assumption that digital transformation is inherently desirable. In the course of the multi-leveled engagement with the research setting, adopting a more critical stance towards the proposed digital transformation of environmental assessments might have provided valuable insights. Such an approach could have contributed to the IS literature by introducing critical research perspectives, challenging established assumptions, and prompting a deeper reflection on the potential consequences and ethical considerations associated with digital transformations.

Within this dissertation, there is relatively less emphasis on visualizing the roadmap. The visualization of roadmaps is considered a critical aspect, especially given the inherent challenges in translating complex roadmapping processes into clear and coherent visualizations. Within the research setting of this dissertation (as explained in Chapter 7 and shown in [P5]), some initial notions have been introduced regarding the visualization of roadmaps. However, it would be relevant to pose the question of what tools could be instrumental for visualizing roadmaps, especially within the context of multi-organizational digital transformation where stakeholders might be geographically distant from each other. Such tools could significantly enhance collaboration and facilitate the implementation of roadmapping practices outlined in this dissertation (see Chapter 7). Additionally, exploring how these tools or technologies for constructing roadmaps can aid in providing the necessary information granularity to support roadmapping deployment through different organizational levels (De Oliveira et al., 2022) would further contribute to the roadmapping literature.

Another perspective to consider is the imperative of continually updating the roadmap, ensuring its ongoing relevance and effectiveness (as presented in Section 3). Building on this observation, a challenge often encountered with planning is its tendency to remain theoretical and not easily translated into actionable steps. To address this challenge, future research could explore how tools for constructing roadmaps can be leveraged to instill a stronger sense of responsibility among stakeholders, thereby facilitating the actual implementation of the devised plan. This integration of tools for stakeholder responsibility would not only enhance the practicality of the roadmap but also contribute to bridging the gap between planning and execution.

While the digital transformation of environmental assessments encompassed both ideals of efficiency and public engagement, it becomes apparent that the efficiency ideal has been given precedence. Although some considerations were made, such as including non-profit organizations in the empirical sampling [P1], a broader inclusivity could have been achieved by incorporating the public in the roadmapping workshop conducted as part of [P5]. This oversight might have limited the diversity of perspectives and could be considered a limitation in the comprehensive exploration of roadmapping practices within a multi-organizational venture for environmental assessments.

This dissertation extends an invitation to fellow researchers to explore the applicability of roadmapping practices and the proposed method in diverse contexts beyond environmental assessments. It could be relevant for fellow researchers to question whether the assumption that digital transfor-

mation is inherently desirable, initiate a more comprehensive exploration of roadmap structures, conduct an in-depth examination of visualization tools, consider information granularity for diverse organizational levels, and integrate tools for fostering stakeholder responsibility. Furthermore, fellow researchers could address the limitations in inclusivity by engaging the public in roadmapping workshops, fostering a broader range of perspectives in multi-organizational ventures. By addressing these aspects, future research has the potential to significantly enrich our understanding and enhance the practical application of roadmapping in the complex environment of multi-organizational digital transformations.

8. CONCLUSION

Since the beginning of this dissertation, the guiding question has been:

What roadmapping practices can support a multi-organizational venture to digitally transform environmental assessments?

In digital transformations opportunities are passing moments, underpinned by a complex and uncertain process filled with inherent challenges. In navigating these passing moments this dissertation reveals that a distinctive characteristic of roadmapping in multi-organizational digital transformations is its deliberative practice emphasizing "*careful exploration to learn about ends, and a subtle but real recognition of other parties*" (Forester, 1999) (p. 86). Specifically, this dissertation provides three roadmapping practices to support multi-organizational ventures in digital transformation, each supported by evidence and engagement with a real-life case of transforming environmental assessments. The identified roadmapping practices of:

- **Inductive experience gathering**, which is instrumental to the deliberation of goals and processes in a digital transformation.
- **Deliberative shifting**, helping reconcile competing perspectives in a digital transformation.
- **Articulating capabilities** for realizing benefits helps reorient the temporal framing of a digital transformation.

These practices not only advance theoretical perspectives, directly targeting challenges raised in (Chapter 2), but also offer practical implications for multi-organizational ventures navigating their digital transformations.

This dissertation represents a distinctive contribution, extending beyond the scope of IS and roadmapping literature, explaining how the two processes of strategizing through roadmapping and digital transformation interrelate. Moreover, an attempt is made to bridge the gap between academic insights and practical applications by introducing a roadmapping framework (see Chapter 6) specifically tailored for practitioners.

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APPENDIX

The appendix of the thesis constitutes these five papers:

[P1] Ashna Mahmood Zada, Peter Axel Nielsen, and John Stouby Persson. 2022. *Setting Goals in a Digital Transformation of Environmental Assessment: A Case Study*. Published in International Working Conference on Transfer and Diffusion of IT (IFIP' 22). https://doi.org/10.1007/978-3-031-17968-6_12

[P2] Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2022. *Roadmapping in the Digital Transformation Literature*. Published in International Conference on Software Business (ICSOB' 22). https://doi.org/10.1007/978-3-031-20706-8_3

[P3] Ashna Mahmood Zada, Cathy Urquhart, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping for Digital Transformation: A Grounded Theory*. Submitted to Information Technology and People (Inf. Technol. People' 24).

[P4] Ashna Mahmood Zada, and Cathy Urquhart. 2024. *Open Coding Qualitative Data: An Essential First Step of Grounded Theory*. To appear in Grounded Theory in Action.

[P5] Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping a Digital Transformation: An Action Design Research Study of Environmental Assessments*. Submitted to European Journal of Information Systems (EJIS' 24).

[P1] Setting Goals in a Digital Transformation: A Case Study

Ashna Mahmood Zada, Peter Axel Nielsen, and John Stouby Persson. 2022. *Setting Goals in a Digital Transformation of Environmental Assessment: A Case Study*. Published in International Working Conference on Transfer and Diffusion of IT (IFIP '22). https://doi.org/10.1007/978-3-031-17968-6_12

Abstract

Since The Sustainable Development Goals (SDGs) emerged in 2015, they have become a guide for managing present sustainability challenges. However, we have limited knowledge about inter-organizational goal setting for digital transformations towards sustainable development. Recognizing this short-coming, we report an in-depth case study of an inter-organizational digital transformation and the challenges of setting goals towards promoting progress on SDGs in environmental assessments. An environmental assessment is an obligatory procedure securing environmental concerns are considered before a decision is made, either for individual projects or public plans and programs. From analyzing the activities in environmental assessments, we outline their distinct digitalization goals and the stakeholders' associated experiences. These findings extend preliminary research on what drives digital transformation in environmental assessment and highlight environmentally responsible activities where information systems can make a difference. The paper discusses how these findings show a further need for research on the digital transformation of environmental assessment.

[P2] Roadmapping in the Digital Transformation Literature

Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2022. *Roadmapping in the Digital Transformation Literature.* Published in International Conference on Software Business (ICSOB '22). https://doi.org/10.1007/978-3-031-20706-8_3

Abstract

Digital transformation is vital for organizations in all sectors, as it changes value creation, customer relationships, and internal processes. A key concern in digital transformations is creating and executing an effective strategy that reimagines the organization. However, structured approaches for reimagination in a digital transformation are still missing. This paper contributes to this concern by reviewing how roadmapping is used in the digital transformation literature. Roadmapping is a flexible technique to support the strategic formulation of short- and long-range changes to software, business, organizational and structural aspects. Reviewing 28 papers on digital transformation, we uncovered five types of roadmapping for reimagining organizations: Product-Technology, Strategy, Business, Data, and Design. For these five types, we unfold the landscape of obstacles, opportunities, and context for different pathways to successfully reimagining organizations in digital transformations.

[P3] Roadmapping for Digital Transformation: A Grounded Theory

Ashna Mahmood Zada, Cathy Urquhart, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping for Digital Transformation: A Grounded Theory*. Submitted to Information Technology and People (Inf. Technol. People '24).

Abstract

Purpose - Roadmapping is a commonly used tool in digital transformation contexts because roadmaps allow us to conceptualise the transformation. Many practitioners use roadmaps to outline perceptions of time, narrative, and to provide an overview of these changes during a digital transformation project, but we lack systematic theorising of this widespread practice.

Design/methodology/approach - To explain how practitioners understand roadmapping and leverage it in digital transformations, we present this grounded theory study of roadmapping in six digital transformation projects.

Findings - Our resulting emergent theory offers a distinction between roadmap conceptualisation and roadmapping process steps. First, the theory explains how project management- and communication tool views, levels of abstraction, dynamic linkages, and principles underpin roadmap conceptualisation. Next, these underpinnings inform the roadmapping process steps of bricolage, asking questions, decision making, narrative building, visualisation, and passage of time. Our emergent theory offers several contributions to roadmapping and digital transformation in research and practice.

Originality/value - This study give useful explanations for 1) how different views shape the roadmap and its use in digital transformations, 2) the practice of leveraging and customising roadmapping for digital transformation through bricolage and 3) the leveraging of roadmaps in practice not only to plan timely events, but to navigate the inherent conditionalities they impose.

[P4] Open Coding Qualitative Data: An Essential First Step of Grounded Theory

Ashna Mahmood Zada, and Cathy Urquhart. 2024. *Open Coding Qualitative Data: An Essential First Step of Grounded Theory*. To appear as a chapter in Grounded Theory in Action.

Abstract

This chapter examines the key first step in grounded theory analysis – open coding. It is notable that open coding is the first stage of analysis across all versions of grounded theory. Open coding is that act of assigning codes to a piece of data, line by line, and sometimes word by word. We would argue that open coding, the act of closely examining the data without preconceptions, almost always reveals something new, something unexpected. This chapter firstly defines open coding, and then examines open coding in the field through the experience of the first author. We reflect on the emotional reactions, the experience and the learning encountered when open coding. We conclude with some practical advice for the first time open coder.

[P5] Roadmapping a Digital Transformation: An Action Design Research Study of Environmental Assessements

Ashna Mahmood Zada, John Stouby Persson, and Peter Axel Nielsen. 2024. *Roadmapping a Digital Transformation: An Action Design Research Study of Environmental Assessments.* Submitted to European Journal of Information Systems (EJIS '24).

Abstract

In the rapidly changing digital landscape of today, organisations must develop strategies for exploring and exploiting the digital transformation of their operations and contexts. However, our knowledge of how to effectively strategise a digital transformation is limited and fragmented. Roadmapping is a flexible process that is widely used to support strategic planning; however, its usefulness to large-scale digital transformations is poorly understood. To explore how roadmapping can support digital transformation, we conducted an action design research study on the digital transformation of environmental assessments in Denmark. Environmental assessment is a procedure mandated by the European Union to ensure the integration of environmental and stakeholder considerations for large programs and projects. Our collaborative action design research on this digital transformation involved problem formulation, artefact creation, and evaluation in three iterations over three years. Based on our findings, we devised three design principles for roadmapping a digital transformation: 1) backcasting from stakeholder experiences to envision future changes, 2) reorientation from linear-time perspectives to a benefits-oriented approach, and 3) deliberative shifting of competing perspectives. We discuss how these design principles offer action-oriented contributions to extant research on strategising digital transformation.