Knowledge about transitions in architectural practices

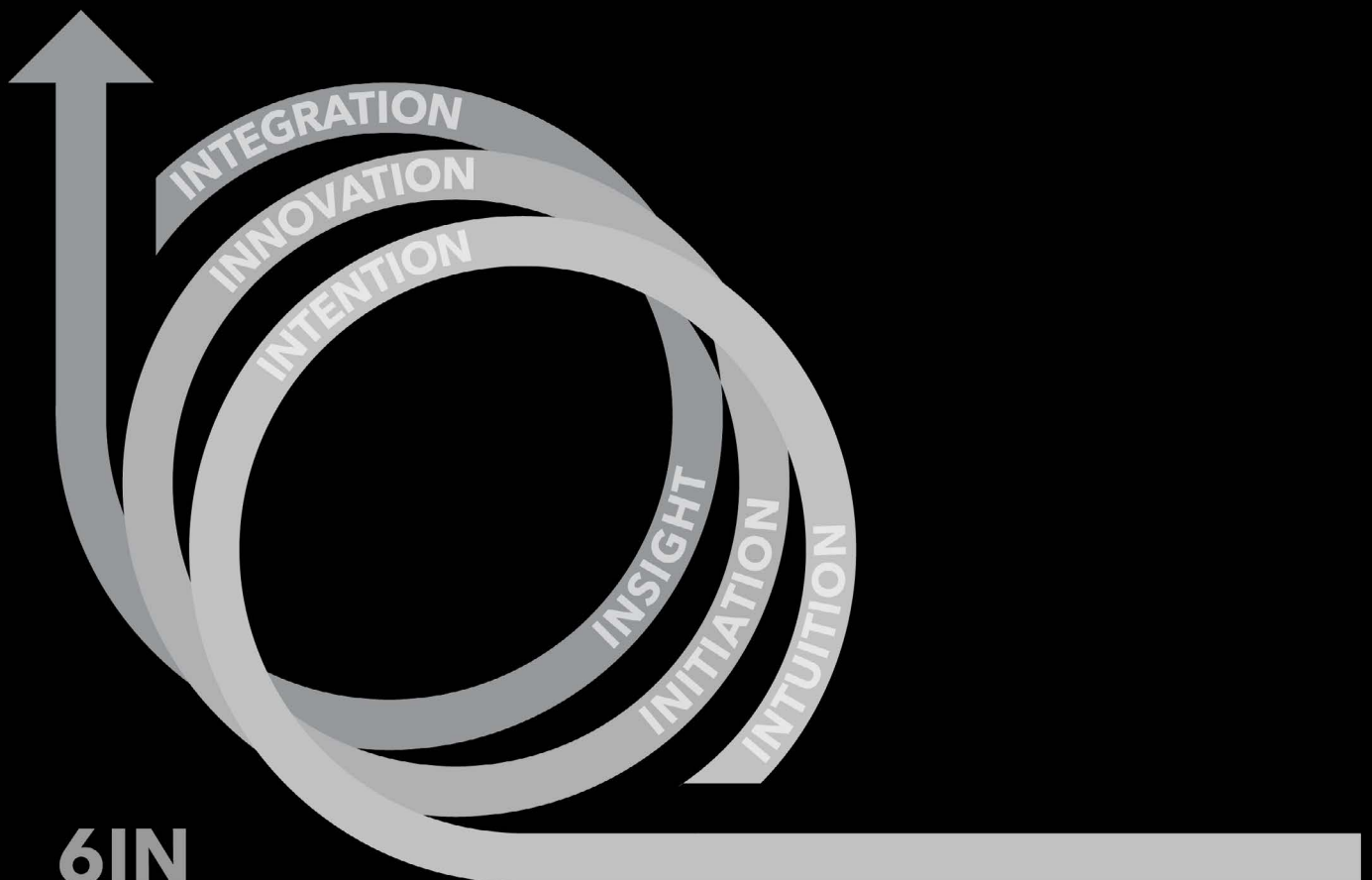## P5 Report. Master Graduation Thesis

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Theme 5:
Sustainability transitions and the
transformation of (port) cities

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INTEGRATION

INNOVATION

INTENTION

INSIGHT

INITIATION

INTUITION

6IN

ABSTRACT

Purpose:

This research aims to investigate how knowledge-sharing can assist architects in managing ongoing and future transitions amid a multitude of external and internal transitions, including shifts in economy, politics, society, as well as emergent demands for sustainability and technological advancements.

Design/Methodology/Approach:

The study will be conducted through empirical research involving a detailed case study of a Dutch architectural firm. It will explore the firm's inter-, intra-organizational and individual dimensions using a combination of observations and interviews. The ultimate goal is to develop effective knowledge-sharing tactics that enable architects to adapt to and cope with the industry's transitions.

Findings:

The proposed framework is based on the theoretical and empirical research and suggests an alternative path related to a transitional approach suitable for architectural offices, in contrast to traditional (top-down) and expansive learning (bottom-up) methods of organizational learning. The research also contributes to understanding the transitional triggers, along with the obstacles and opportunities faced along the way.

Practical Implications:

The findings emphasize the importance of developing knowledge-sharing tactics that are adaptable to the changing needs of the architecture industry. These tactics are intended to aid architects, project managers, and process managers in navigating through transitional changes effectively, fostering an interconnected environment among stakeholders in the construction industry.

Originality/Value:

The research adds academic value by bridging the concepts of knowledge-sharing and transitions and examines the application of knowledge-sharing tactics in the context of architectural practices. It introduces a novel framework — a 3-iteration model based on 'thinking-doing-saying' actions, which includes two steps per action and forms the following sequence: intuition, intention, initiation, innovation, insight, and integration. This framework benefits the interconnection of stakeholders in the construction industry, particularly architects, project and process managers, and potentially entrepreneurs in creative industries.

KEYWORDS: transition, knowledge-sharing, knowledge-management, coping tactics

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GLOSSARY

Information In this study, information is seen as a foundation for knowledge creation. It is generated by individuals or groups and contains some explicit knowledge. Knowledge is created or recreated when this information is interpreted, adding to personal knowledge repositories. In theory, knowledge grows as information is understood and connected to what one already knows.

Knowledge This research views knowledge as existing within individuals (who represent their organizations) and within organizational routines (which influence individual knowledge). Knowledge gains relevance and utility when applied to work, tasks, or problems faced by organizations. It's considered a personal collection shaped by various factors like experience, education, culture, and personality, though these factors are not the main focus of the study.

Knowledge about transitions (KaT) as knowledge management itself became *"an element of transition between traditional processes and the current needs demanded by technological change."* (Yepes and López, 2021, p. 671) In this research, KaT is the knowledge, that helps to cope with ongoing transitions.

Knowledge Sharing (KS) Knowledge sharing is the exchange of skills, experiences, and insights among people. It encompasses both direct (through social interaction) and indirect (using tools and artifacts) processes, involving language-based and non-language-based communication. In this research, two forms are evident: indirect sharing using tools and artifacts, which overlaps with information sharing, and direct social interaction, where language facilitates the sharing and validation of knowledge.

Knowledge Sharing Coping Tactics (KSCT) In this study, KST are defined as planned methods, which help architects on inter-, intra-organizational and individual levels to cope with ongoing transitions through knowledge sharing. KST are related to multiple perspectives of intercation, including actor-actor, actor-group, actor-ai, actor-tool, actor-artifact and group-context.

Transitions in this study, as described by Amado and Ambrose (2018), are not just a specific type of change but a distinct process that unfolds consistently across various human contexts, whether societal, organizational, or personal. This process involves the modification or complete overhaul of existing structures within a system, leading to the emergence of new structures and a realignment of these structures within the whole system. In this study transitions divided to external (top-down to architectural offices) and internal (bottom-up approach by architectural offices themselves).

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1. The urgency to cope with transitions

The Dutch construction industry is undergoing substantial changes due to new collaborative, regulatory, technological, and sustainable initiatives. Driven by global events, these long-term changes are referred to in the built environment as transitions.

"In attempting to identify the nature and characteristics of a continuous unrecognized "undercurrent" as well as more obvious identification of step-change, we need to use that more appropriate dynamic, "transitional"[change]." (Amado and Ambrose, 2018, p. xi)

Transition is fundamentally a psychosocial process, involving a change at both social and psychological levels simultaneously. Social factors include tangible elements like products, services, technologies, organizational structures, and cultural norms, governed by technical, economic, and legal principles. On the other hand, psychological factors encompass individual beliefs, values, hopes, anxieties, and thought processes. These internal factors influence how people perceive and interact with their external environment, shaping their actions and responses to bring about change. Transition is fundamentally a psychosocial process, involving changes at both social and psychological levels simultaneously. Social factors include tangible elements such as products, services, technologies, organizational structures, and cultural norms, governed by technical, economic, and legal principles. Conversely, psychological factors encompass individual beliefs, values, hopes, anxieties, and thought processes (Amado and Ambrose, 2018).

These internal factors influence how people perceive and interact with their external environment, shaping their actions and responses to bring about change (Amado and Ambrose, 2018). Although interconnected, transitions in construction industry are typically studied through a particular perspective. Several of the most prominent categories are outlined below.

The first category of transitions involves **organizational changes**. This includes a shift in **contractual models** from the traditional **Design-Bid-Build (DBB)** approach to the **Design-Build (DB)** strategy (Moynihan & Harsh, 2015). This shift often necessitates new forms of collaboration between stakeholders, such as **Public-Private Partnerships (PPP)** (Jacobson & Ok, 2008), and new **governance models** capable of accommodating user involvement, such as urban commons (Petrescu & Petcou, 2023), as well as new conditions for **boundary work** and responsibilities of the architects in the supply chain (Bos-de Vos et al., 2019). Simultaneously, working in **virtual environments** and within temporary, **interdisciplinary teams** presents substantial challenges (Bellamy et al., 2005).

The second of these critical transitions is **sustainability**. This encompasses various dimensions, including **economic** and **environmental sustainability**, with a focus on concepts like the **circular economy (CE)** (Pomponi & Moncaster, 2017), **energy transitions** (Lygerakis et al., 2022), and **climate change adaptation** in design (Gibbs & O'Neill, 2015). Additionally, the **social** and **economic sustainability** aspects, including **health and well-being** considerations, and the **post-pandemic design perspectives** (Alhusban et al., 2022), play a pivotal role. **Cultural sustainability** is also a key perspective, emphasizing **inclusivity, equality**, and **accessibility,** addressing issues related to cultural and just transitions (Lakshmanan et al.).

The third major transition is triggered by **technology**. Starting from a digitalization perspective, such as **Building Information Modeling (BIM)** (e.g., Gless et al., 2017), and **data-driven, parametric**, and **artificial intelligence (AI)** design (Yu & Gero, 2015) within architectural offices. It extends further to the global scale of **Smart Cities** and the **Internet of Things (IoT)** (Lima et al., 2017, Lygerakis et al., 2022) and the application of **Big Data Technology** (Yu and Yang, 2018). Moreover, from a manufacturing standpoint, advancements like **3D Printing** and **Advanced Manufacturing** (Kothman & Faber, 2016) and **Modular and Prefabricated Construction** (Tavernier et al., 2021) are of significant relevance.

In today's environment, where adapting to continuous and often unpredictable changes is crucial, many business leaders and managers struggle not only with identifying the challenges they face but also with understanding how to think about essential changes in the technical and social aspects of their roles.

1.2. The urgency of knowledge-sharing in architectural offices

The urgency for knowledge-sharing (KS) in the construction industry is highlighted by its significant impact on organizational competitiveness and the mitigation of project complexity (Cooke, 2013). Knowledge-sharing is not just an activity but a critical means for employees to enhance knowledge application, drive innovation, and thereby contribute to the competitive advantage of their organization, as noted by Wang and Noe (2010).

Knowledge in the construction industry is deeply embedded in individual and collective experiences and operative procedures. Styhre and Gluch (2010) point out that when a construction project concludes, much of this collective expertise risks being lost, or at best, it remains with the coworkers who move on to the next project. This transient nature of knowledge underscores the importance of systematic knowledge-sharing practices. However, the construction industry faces significant challenges in implementing effective knowledge-sharing. Gluch and Räisänen (2009) identified that in complex issues like sustainability, knowledge-sharing is hindered not by a lack of information, but due to inconsistencies between communication cultures and the methods used to convey information (Styhre and Gluch, 2010). Furthermore, knowledge does not circulate freely within an organization; it is often localized, contingent, and bound to individual and local practices. Lave and Wenger, Szulanski, Von Hippel have all highlighted the *"stickiness"* of knowledge, indicating that sharing it requires the support of specific tools and mechanisms.

Companies in the built environment are characterized as ***project-based organizations (PBO)*** (Whyte et al., 2008) and temporal nature of the projects (Bashouri & Duncan, 2014b). In BPO knowledge management serves as a crucial bridge between traditional processes and the evolving requirements brought about by transitions (Yepes & López, 2021). To address these challenges, strategic knowledge management (KM) needs to be established. According to Bashouri et al. (2014a), this involves change and learning aimed at developing both the organization and its members. It requires creating an environment conducive to interaction and knowledge exchange, contributing not only to staff satisfaction but also enhancing the firm's reputation and competitive advantage.

1.3. The urgency to bridge transitions and knowledge-sharing in architectural offices

Modern Dutch architects are confronted with a multitude of transitional changes, including sustainability, technology, and organizational transitions, where knowledge management itself became *"an element of transition between traditional processes and the current needs demanded by technological change."* (Yepes and López, 2021, p. 671) The strategic location of Rotterdam and Amsterdam, home to influential architectural firms and academic institutions, as highlighted by Kloosterman (2008), positions these cities as ideal settings for analyzing and adapting to the current industry changes.

Despite a wealth of literature on knowledge-sharing has been conducted in America (Lester, 2023) and Asia (Zhang and Sun, 2020), it tends to focus either on the approach (Bektas, 2013) or the mechanisms involved (Yang et al., 2019; Lester, 2023), with limited attention given to comprehensive tactics, which can be used at inter-project, intra-project, and organizational levels (Wang and Noe, 2010; Yepes and López, 2021). While the topic of *'change'* and *'transitional change'* in particular *"is not well appreciated in the extant literature."* (Senaratne and Sexton, 2008, p. 1303), (Amado & Ambrose, 2018)
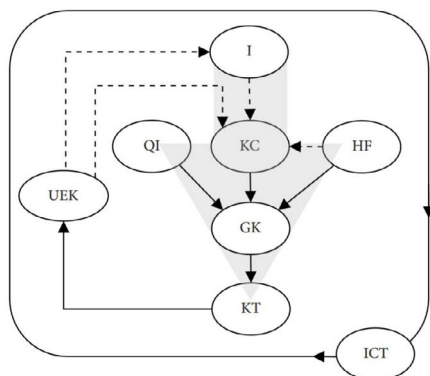
Innovation (I); Quality of Information (QI); Knowledge Culture (KC); Human Factors (HF); Use and Exploitation of Knowledge (UEK); Generation of Knowledge (GK); Knowledge Transfer (KT); Information and Communication Technologies (ICT)

Figure 1:
The knowledge management cycle in organizations.
Source: Yepes & López, 2021

Factor	Percentage
Generation of Knowledge	6.5
Quality of Information	3.7
Knowledge Transfer	23.4
Use and Exploitation of Knowledge	24.3
Innovation	6.5
Information and Communication Technology	22.4
Knowledge Culture	10.3
Human Factors	2.8
Total	*100.0*

Table 1:
Classification of papers and percentage of directions studied between 2020- 2021.
Source: Yepes & López, 2021

The human factor and its relation to knowledge culture and innovation (as a part of transitional change), as explored by Yepes and López (2021) (Figure 1), remains the most under-researched area in the topic of KM, both in general theory and within the built environment.*"Comparatively speaking project-level KM and firm-level KM attracted too much attention, but individual KMs in construction teams and KM system for the whole industry were lack of deep study."* (Yu and Yang, 2018, p. 794) While the original focus on individu-

al coping tactics can form the company culture for knowledge sharing. Additionally, the previous research outcomes in this field often refer to the professional image challenges and working cultures. For example, Bektas (2013, p. 291) suggests that *"individualistic cultures are likely to exhibit less knowledge-sharing than collective cultures"*. Kloosterman (2008) contends that the challenge lies in the strong egos of architects and the belief that *"collaboration dilutes their design"*.

Bektas (2013) came up with similar conclusions in interviews about lead designers, who have been found problematic by other stakeholders in social practices. This leads to knowledge exchange primarily occurring among the younger generation of architects, many of whom are foreigners. However, this tendency may trigger additional challenges in the future: considering trust as a fundamental prerequisite for knowledge-sharing and the fact that millennials tend to express significantly less trust than other generations, as noted by Lester (2023), there is a pressing need to investigate motivation mechanisms (Wang and Noe, 2010), team composition, and personality factors. This research is essential for addressing these complex challenges and facilitating effective knowledge-sharing in the architectural industry.

Despite of the many researchers insists on a balanced approach (Bashouri & Duncan, 2014a) and holistic framework (Bektas, 2013) towards KM in construction industry, in practise it is often overlooked, technological importance is prevailing and human factor is neglected (Yepes and López, 2021). At the same time, most of the tactics has been created for contractor and has a tendency for standartization, which are not suitable for custom solutions aestetic ambitions of architect (Styhre & Gluch, 2010).

Several studies have addressed the need for qualitative research to better design quantitative studies (Wang and Noe, 2010) among innovative Dutch architectural firms (Kloosterman, 2008). *'Data should be collected from semi-structured interviews, the research group, meetings of the Communities of Practice (CoPs), and from notes taken by the researcher'* (McNiff and Whitehead, 2006, p.175).

Overall, there is an abundance of literature on knowledge-sharing (KS) within KM in the construction industry, while research focusing specifically on 'transitional change' in this sector, particularly among architectural practices, remains limited. Furthermore, the relationship between transitional changes and knowledge-sharing tactics, , which can be implemented from individual and further enhanced on organizational and inter-organiztional levels, has yet to be fully explored and established.

1.4 Societal and scientific relevance

This thesis accelerates understanding of transitions faced by modern Dutch architects, including market demands, policy regulations for circularity, and procedural components. It also addresses emergent changes in professional roles, encompassing new forms of collaboration, skills, knowledge, and technological advancements. The research investigates how knowledge-sharing assists architects in managing ongoing and future transitions, by developing a set of coping tactics for knowledge-sharing.

The scientific relevance of this research addresses the gap identified in the literature concerning the relationship between transitional changes and knowledge sharing. Analyzing interactions of knowledge-sharing along transitional processes and considering both internally and externally driven transitions, this research offers insights into the triggers of these processes, common obstacles, and opportunities that stimulate progress. It draws connections between a company's organizational structure, and knowledge-sharing tactics, benefiting stakeholders in the construction industry, particularly architects, project, and process managers, and potentially entrepreneurs in creative industries.

1.5 Research questions

This research aims to investigate how knowledge-sharing can assist architects in managing ongoing and future transitions. That's why the main research question of this research is as follows:

How does knowledge-sharing help architects cope with ongoing and future transitions?

To answer this question, a series of overarching sub-questions (SQ) have to be answered:

RQ 1: What are the **ongoing transitions** experienced by architectural practices?

RQ 2: How does **knowledge sharing** influence ongoing transitional processes in architectural practices?

RQ 3: What **knowledge-sharing tactics** can be drawn to **cope with** ongoing and future **transitions** in architectural offices?

In order to answer the main research question, all 3 research subquestions will be first answered by theoretical studies of secondary data and then will be examined by empirical research through interviews and observations.

1.6 Conceptual model

From these questions, two main concepts in this research can be derived: *'ongoing transitions in Dutch architectural practices'* (referring to RQ1) and *'knowledge-sharing tactics to cope with transitions'* (RQ3). The link between them will be explored in the area of *'knowledge management and sharing'* (RQ2) (see Figure 2). The framework will be further developed along the report, as both theoretical and then practical components are explored. These three concepts form the foundation for the entire research, influencing the whole report structure from the research questions to the structure of the theoretical background, as well as the design of the interviews and their specific questions.

Figure 2.
Conceptual model. Source: by author

(Q1) ONGOING TRANSITIONS IN ARCHITECTURAL PRACTICES — (Q2) knowledge management and sharing → **(Q3) KNOWLEDGE SHARING TACTICS TO COPE WITH TRANSITIONS**

THEORETICAL BACKGROUND

THEORETICAL BACKGROUND

This chapter aims to provide a theoretical background for this study, by answering RQ1, RQ2, and RQ3 through the information, gathered from secondary data. This chapter is structured in an order of research questions. The method of acquiring and structuring the information for theoretical background is described in Chapter 3.

2.1 Transitions in Architectural Offices

This chapter provides an answer, based on theoretical studies on **RQ 1: What are the ongoing transitions** experienced by architectural practices?

This chapter is structured as follows: (1) first, it will provide definitions and concepts of transitions; (2) then, it will summarize the historical development of the topic; (3) this will be followed by an examination of the essential features of transitional management in organizations; (4) propose the framework how the transitions in architectural practices can be viewed. The chapter will conclude with an answer to RQ1 and an overview of the lessons learned.

2.1.1 Concepts and Dimensions of Transitions

Transition, as described by Amado and Ambrose (2018), is not just a specific type of change but a distinct process that unfolds consistently across various human contexts, whether societal, organizational, or personal. This process involves the modification or complete overhaul of existing structures within a system, leading to the emergence of new structures and a realignment of these structures within the whole system.

In the human context, transitions become significantly more complex due to the influence of human consciousness, including awareness, motivation, purpose, and even unconscious factors. Such transitions are contingent on the voluntary choices of the individuals involved in the system, as well as certain characteristics that enable this process. The transition process in social and organizational contexts deeply involves the mental processes of individuals as they either facilitate or resist changes in the purpose, structure, and functioning of organizations or groups. This process is as much about human perception, cognition, and emotion as it is about organizational and social interaction. Thus, social and organizational transitions are seen as psychosocial processes occurring within psychosocial systems. This implies a continuous interaction between the external, objective aspects of the environment and the internal, subjective experiences of individuals. This interaction forms the psychosocial framework of the transition process. Transitional thinking addresses this imbalance by highlighting the importance of psychological *"internal"* factors within individuals who collaborate with others to effect fundamental changes in *"external"* circumstances.

2.1.2 Studies on Transitions

Scholar's works on transitions in organizational and personal development is growing from several fundamental studies, including Winnicott's (1951) examination of personal transition during early infancy. Winnicott introduced the concept of *'transitional objects'* in the context of infant development, in which equivalents have been also later found in adult life connected to various developmental processes. While Harold Bridger's works in the 1950s linked transitional phenomena in child development to psychosocial processes in organizational and social transitions.

In parallel to those, Kurt Lewin's work in the 1940s further deepened this field by introducing the model of organizational change involving *"unfreezing," change*, and *"refreezing"* stages, primarily focusing on group dynamics within organizational contexts. His approach emphasized the dynamic balance of forces in group behavior, the importance of group decision-making, and the critical role of leadership in guiding change.

One of the most important approaches to organizational change is *organization development (OD)*, which was born around the end of the 1950s in the United States by Lewin and then continued at the National Training Laboratory of MIT. OD became synonymous with systemic and intentional change, also stressing group dynamics, participatory decision-making, and continuous improvement through action research. By the mid-1980s, Bridges distinguished between *organizational change* and *organizational transition*, noting that while change is structural and can be planned, the transition is a psychological process involving a reorientation of actions and meanings. This perspective was echoed in the view that organizational transition involves the modification of fundamental values and the institutionalization of new meanings.

Recent developments in the 1980s and 1990s manifest the concept of *organizational culture* (Laurent, 1990) and *organizational learning* (Fiol & Lyles, 1985), which represents a paradigm shift in organizational theory,

viewing organizations as social constructs with shared meanings and values, where change is not just structural but involves a shift in these core values and meanings. This type of change is dynamic, leading to new interpretations and actions that disrupt established patterns, signifying a deeper cultural transformation within the organization. Moreover, organizational learning involves developing more profound and extensive perceptions, knowledge, and the ability to reflect. This form of learning is tied to an understanding of causality, implying that it's not just about adapting to changes but also about comprehending the underlying reasons and consequences of those changes (Amado & Ambrose, 2018).

The paradigm of organizational learning encompasses a broad range of concepts and practices, complicating attempts to generalize comparisons with the transitional approach. Nonetheless, methods derived from this paradigm typically differ from the transitional approach as they are predominantly top-down in nature, and they do not similarly investigate individual and collective subjective experiences. Moreover, in regards to organizational learning, which views paradoxes as problems to be solved, transitional thinking sees them as part of daily routine, which should be balanced and optimized. However, even in day-to-day life, it is necessary to identify the difference between designed change, which is intentionally initiated by public or private organizations, and spontaneous change, which appears without any conscious effort to design it (Amado & Ambrose, 2018).

2.1.3 Key features of the transitional approach to change management

Amado and Ambrose (2018) define essential conditions for transitional management, that support the transition process at both psychological and social levels, thereby aiding and advancing its development:

Open-System Perspective: This aspect emphasizes the importance of understanding and balancing the internal and external forces affecting an organization. It requires broadening the understanding of how an organization operates within its environment and adapting to external changes.

Collaborative Management Style: Focuses on fostering autonomy and responsible self-management in individuals and groups. This style supports versatility, spontaneous thinking, and action, encouraging initiative from within rather than direction from the top.

Providing a "Holding Environment": Involves creating conditions that enable transitions at psychological and social levels. This includes both controlling and directing functions, as well as fostering an environment that supports transitional change within organizational members.

Problem Tolerance: Emphasizes the management of complexities, uncertainties, and conflicts that arise in rapidly changing environments. This involves facing system inadequacies and tolerating dissonance between the system and its environment.

Potential Space and Playing: Refers to creating an environment that allows for innovative thinking and problem-solving, crucial for identifying and implementing new solutions and organizational designs.

Facilitating Transitional Learning: Focuses on a process that involves *"testing-out," "working-through,"* and *"design"* to apply new possibilities and bring about necessary changes or transformations in the real system.

Double-Task Process: This process requires acknowledging and increasing awareness of underlying psychosocial processes. It involves a 'group review' to enhance understanding and effectiveness regarding the total process occurring.

Developmental Potential: Recognizes the differences in individuals' readiness for change and includes even those resistant to change as important parts of the system for achieving significant changes.

Transitional Space and Containment: Involves creating sufficient time, appropriate locations, and group toleration for engaging in transitional learning. This space is seen as an external condition necessary for such learning and innovation to occur effectively.

2.1.4 Conceptual Model on Transitions in Architectural Offices

Despite *'transition'* becoming a buzzword in the built environment, the research papers normally refer to a particular type of transition (ex. Transition to the circular economy). Several frameworks highlight the interdisciplinary nature of transitions, for instance, PESTLE (Johnson et al, 2008). However, those frameworks are focused on the perspectives, triggerd by external factors. The transitions in architectural practices can arise from the changes in the market demand or can be driven internally by architectural practices that focus on

innovation. Pomponi and Moncaster (2017) refer to a similar conceptual model (Figure 3), which outlines both top-down and bottom-up processes, but it cannot be fully applied as it is still missing intra-organizational and design-approach transitions of architectural offices.
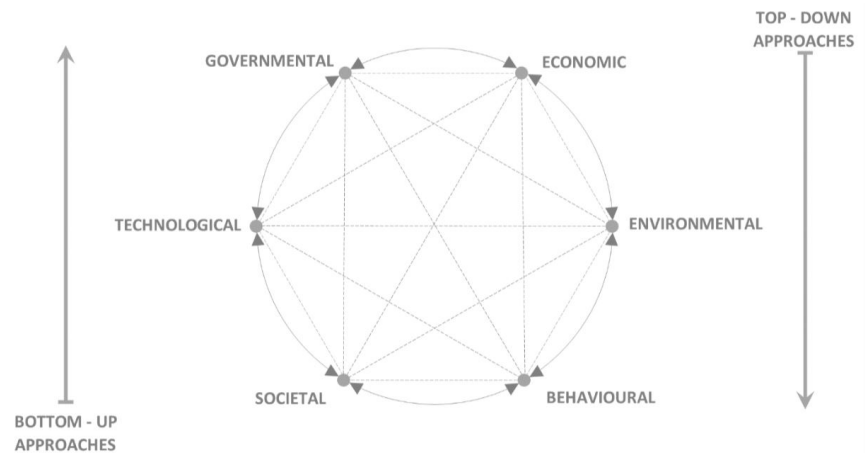
Figure 3:
Frame of reference: six dimensions for
building research in a circular economy
Source: Pomponi and Moncaster (2017)

A new framework to study transitions in architectural offices has been proposed (Figure 4). **'8 transitional dimensions in architectural practices'** indicates both the internal and external nature of the transitions, where the **technological** and **sustainable** transitions are considered as both bottom-up and top-down processes. While the other 6 dimensions are organized by groups, therefore external **societal** change corresponds to the way how architects **behave**, the changes in **procedural** dimension correlate with the **project approach**, and finally the **economic** changes are connected to the **organizational** modifications and the models of value generation.
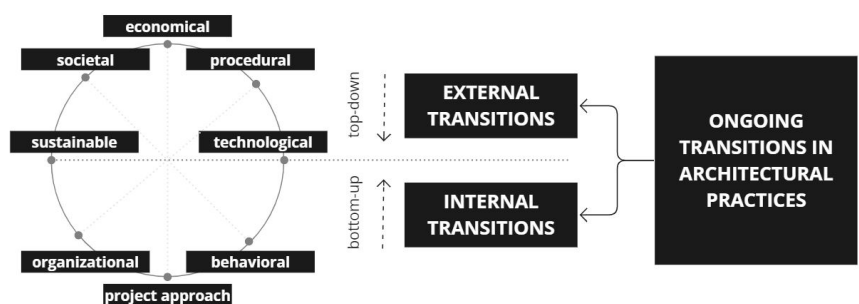
Figure 4:
Transitions in architectural practices
Source: by author

2.1.5 Conclusion on Transitions in Architectural Offices
RQ 1: What are the **ongoing transitions** experienced by architectural practices?

In specific sectors, such as Dutch architectural firms, this approach to transitions can be observed through various lenses, including sustainability, technology, and organizational structure. The proposed framework divides the transitions in architectural practices into external and internal types and includes dimensions such as project approach, organizational and behavioral for the internal type, and **societal, economical**, and **procedural** for the external, while **sustainable** and **technological** transitions can occur at both internal and external levels.

This holistic view of transitions, encompassing industry shifts, changing role of the architect, societal changes, cultural shifts, and technological advancements, underscores the multifaceted nature of change management. It illustrates how transitions are not merely structural changes but involve deep-seated shifts in the way organizations operate, learn, and adapt to their environments. The case of Dutch architectural firms serves as a prime example of how these principles are applied in a specific industry.

During the literature research, it becomes clear that in order to facilitate a transition process, the human factor, from both organizational and individual perspectives, plays one of the key roles. It is based on deep collaboration, openness to exploration, and the ability for self- and group reflection. The approach to transitional thinking differs from traditional organizational learning as it views paradoxes as part of a routine, which should be balanced and optimized, instead of being fixed and resolved.

2.2 Knowledge management and knowledge-sharing in architectural offices

In this chapter, RQ2 will be answered by explaining: How does **knowledge sharing** influence ongoing transitional processes in architectural practices?

This chapter is structured as follows: (1) it begins by explaining general concepts and dimensions of knowledge; (2) then, it delves into the nature of knowledge in architectural offices; (3) afterward, it discusses knowledge management approaches and mechanisms; (4) this includes an analysis of knowledge-sharing as a part of knowledge management, along with its techniques; (5) it underlines the challenges and opportunities of knowledge management (KM) and knowledge-sharing (KS) (6) subsequently, the chapter highlights the processes within knowledge-sharing and propose the framework to analyze the interactions in architectural practices. The chapter will conclude with an answer to RQ2 and a summary of the outcomes.

2.2.1 Concepts and Dimensions of Knowledge

"In construction projects, when project teams manage change situations, knowledge plays a key role" (Senaratne and Sexton, 2008, p. 1304). Studies have illuminated the distinctions between **data** (discrete, elementary facts or observations), **information** (described as *"a flow of messages"* by Nonaka (1994)), and **knowledge**, which formed together the **DIK-Wisdom hierarchy model** (Ackoff, 1989; Rowley, 2007). Knowledge, according to Nonaka (1994) is *"created and organized by the very flow of information, and anchored on the commitment and the beliefs of its holder."* (Szulanski, 1996) defines knowledge as the **"transfer of best practices,"** which pertains to how knowledge circulates within an organization. In order to define the impermanent nature of knowledge Orlikowski (2002, pp. 252–3) writes that *'[k]nowledge is an ongoing social accomplishment, constituted and reconstituted in everyday practice. As such, knowing cannot be understood as stable or enduring. Because it is enacted at the moment, its existence is virtual, its status is provisional'.*

In attempting to define types of knowledge, researchers often distinguish between **"know-how"** and **"know that,"** as exemplified by Garud (1997), and between **"tacit"** and **"explicit"** knowledge, a concept articulated by Polanyi (1966) and further elaborated by Nonaka and Takeuchi (1995). Nonaka (1994) describes explicit or codified knowledge as the type that can be conveyed in a formal, structured language. In contrast, tacit knowledge possesses a personal aspect, making it difficult to formalize and convey. This kind of knowledge is intrinsically linked to action, dedication, and engagement within a particular context.

The processes of knowledge creation within these two dimensions are structured by Nonaka (1994) into four distinct phases, visualized in Figure 5. The mode of **socialization** arises from the conversion of implicit to implicit knowledge. Here, implicit knowledge is exchanged directly among individuals through shared activities, including observation, imitation, and practice. The process of turning implicit knowledge into explicit knowledge is known as **externalization**. This occurs within a team setting, utilizing methods like metaphors, analogies, and models, often facilitated by practices like **"reflection in action"** (Schon, 1983). The **combination** mode is the result of converting explicit knowledge to explicit knowledge. It involves merging various sets of explicit knowledge, which is documented through meetings, discussions, and networks. Finally, the transformation of explicit knowledge into implicit knowledge is termed **internalization**. This happens when individuals internalize the experiences of others, which are available in explicit form.

According to Nonaka (1994), the ability of knowledge to flow enables it to be present across various levels, including individual, group, organizational, and inter-organizational. Knowledge can manifest as either *'leaky,'* signifying the phenomenon of explicit knowledge leaking across organizational boundaries (Liebeskind, 1996; Wernerfelt, 1984), or *'sticky,'* referring to the difficulty of its effective transfer within an organization due to its tacit qualities (von Hippel, 1994, 1999; Szulanski, 1996). The social aspect plays a pivotal role in determining whether knowledge is sticky or leaky, as highlighted by Kogut and Zander in 1995 and highly depends on the context of organizational and human factors.

	Tacit knowledge	*To* Explicit knowledge
Tacit knowledge	Socialization	Externalization
From Explicit knowledge	Internalization	Combination
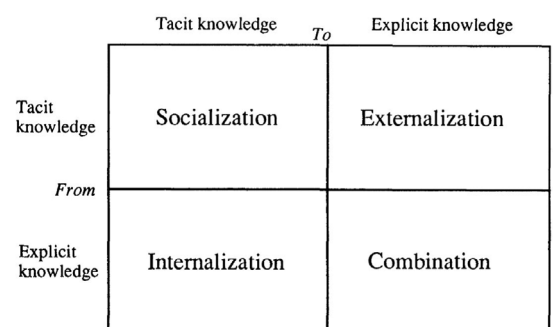
Figure 5:
Modes of the Knowledge Creation.
Source: Nonaka (1994)

2.2.2 Knowledge in Architectural Offices

This chapter dives into the concept of knowledge, specific to architectural companies and the Dutch context in particular.

Architects have to adopt a solution-focused approach in design, which demands the continuous accumulation of knowledge, as some knowledge may be critical for one project but inconsequential for another (Bashouri & Duncan, 2014). *"The architectural firm is a knowledge-based organization, and the architect is a knowledge worker"* (Winch and Schneider, 1993). According to (Bashouri & Duncan, 2014a), the knowledge gained from practicing architecture was deemed the most significant. The skills and proficiency of the employees were regarded as the key assets of the company.

Architectural firms can be further classified based on their aesthetic and quality preferences, falling into categories like **strong delivery, strong experience, strong ambition,** and **strong ideas** (Winch and Schneider, 1993). In this classification, "superdutch" architectural firms (located in Rotterdam/ Amsterdam proximity), as identified by Kloosterman (2008), are associated with the strong-idea type.

Rooke and Clark (2005) refer to 3 types of knowledge in architectural practices. **Explicit knowledge** is exchanged through both direct, face-to-face communication and distant interaction methods, as well as through social engagements, and can be gained by '*direct instructions*'. **Conscious tacit knowledge** is disseminated via mentorship approaches, recognizing the presence of tacit knowledge and its potential for sharing, and can be gained by *'watching more experienced co-workers'*. The third type is **unconscious tacit knowledge**, Conveyed through observation, acquired by emulating, experimenting with the actions observed, and '*trying things out'*.

2.2.3 Knowledge Management in Architectural Offices

This chapter provides perspectives on how knowledge is managed in architectural companies.

"Knowledge management in the construction industry has become an element of transition between traditional processes and the current needs demanded by technological change." (Yepes and López, 2021, p. 671)

In the initial phases, the focus on of topic of knowledge management was primarily on technological advancement. Early knowledge management (KM) closely resembled information management. Only a handful of researchers attempted to apply traditional management theories to investigate KM techniques and methods. However, from the start of the twenty-first century, there was a shift in emphasis towards the significant contribution of socio-technical aspects. After 2012, concepts like **social networks**, **social psychology**, and **social behavior** became key in elucidating the principles of KM. Nowadays 3 contemporary ways for Methodology and approach for KM in the construction industry are: s**ocio-technique, IT**, and **knowledge process tools**. Socio-technical factors and IT contribute to the advancement of KM systems in construction projects, and the knowledge process is inherently integrated into the construction process to enhance managerial efficiency (Yu & Yang, 2018). With the existence of an approach variety, scholars recommend a balanced and custom-made approach for KM, which depends on the overall strategy of the architectural studio (Bashouri et al., 2014, Bektas, 2013)

Whyte et al., (2008) and Canavan et al. (2013) categorize into two types of architectural firms. The first type is the practices that support **exploitation** and focus on a **product portfolio**, emphasizing learning and knowledge development that streamline decision-making and delivery for familiar, measurable, and structured design challenges (explicit knowledge). An alternative strategy is **exploration** and **artistic competency**, focusing on learning and development tactics to comprehend relatively unknown, immeasurable, and unstructured design issues (tacit knowledge). These observations imply that various visual practices can be beneficial for managers and project teams when tackling the dual tasks of exploring and exploiting opportunities.

Therefore there are also 2 distinct perspectives on knowledge management: **information and communications technologies (ICTs)**(tool approach) (for ex. Leung 2004)., and **human resource management (HRM), (people approach)** (for ex. Mertins et al. 2001). That's why organizations employ two primary KM approaches: **codification**, which utilizes information and communication technology to systematize knowledge, and **personalization**, which relies on sharing values via social networks (Robinson et al., 2005). Hansen et al. (1999) and (Canavan et al., 2013) suggest IT tools (codification strategy) for explicit knowledge-sharing and suitable for the firms, following product portfolio strategy, while *'people-centered techniques'* (personalization strategy) are more suitable for tacit knowledge flow in the firms with an artistic competency strategy. These methods, integrating *'socio-technical'* elements, are complementary and enhance organizational KM (Easter-

by-Smith and Prieto, 2008).

Construction literature indicates a preference for viewing knowledge as a process rather than an asset. In contrast to other industries, construction firms tend to prioritize personal or community-based knowledge and reliance on social practices over formalized and codified operative knowledge (Styhre & Gluch, 2010). Tacit knowledge, crucial for problem-solving in projects, often necessitates personal interaction despite the increasing use of IT systems (Gann and Salter, 1998).

2.2.4 Knowledge-sharing in Architectural Offices

This chapter will introduce the concept of knowledge-sharing as a part of knowledge management, and provide its suitable approach for architectural offices.

"Knowledge-sharing is the ultimate goal of knowledge management. After the development of knowledge management, people who need to apply knowledge to a particular project can access relevant knowledge for reuse. If necessary, they can adapt it to a new project and solve the new problem." (Kazi, 2005, p. 593)

The **construction knowledge management life cycle**, as depicted in Figure 6, consists of five stages: k**nowledge acquisition, knowledge extraction, knowledge storage, knowledge-sharing**, and **knowledge update** (Kazi, 2005).
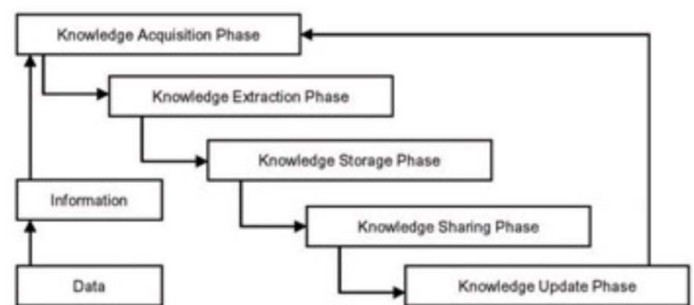
Figure 6.
Five phases of construction knowledge
management. Source: Kazi (2005)

Brown and Duguid (2001) discuss the concepts of *"sticky"* and *"leaky"* information in relation to Communities of Practice (CoPs), the concept introduced by Lave and Wenger, which defines a group of people who share a concern or a passion for something they do and learn how to do it better through regular interaction. CoPs are characterized by mutual engagement, a shared domain of interest, and a shared repertoire of resources such as experiences, stories, tools, and ways of addressing recurring problems. These communities are key to sharing knowledge, fostering innovation, and developing professional skills. Within a CoP, knowledge often becomes *"sticky,"* meaning it is deeply embedded within the community and can be challenging to transfer outside of it. This stickiness arises because the knowledge is so closely tied to the community's specific context, practices, and understanding. On the other hand, they also note that CoPs can have *"leaky"* qualities, as they can also leak out or be shared with other communities and areas of an organization. This leakage can facilitate the cross-pollination of ideas and practices, leading to innovation and organizational learning.

CoP appears in literature as one of the fundamental approaches to organizational knowledge-sharing. Sharing knowledge among communities not only fosters organizational learning and innovation (Brown & Duguid, 2001; Wang & Noe, 2010) but also plays a crucial role in skill development and the building of social relationships (Bashouri et al., 2014a). This process enables knowledge to exist at individual, group, and organizational
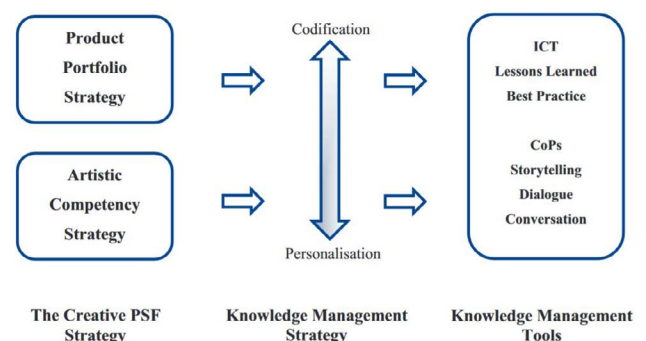
Figure 7.
A guide for linking strategy to KM strategy
through CoPs (Bashouri et al., 2014)

levels, thereby increasing the effectiveness of the organization. According to Bashouri et al. (2014a), in the perspective of CoPs, knowledge-sharing tools for personalization include storytelling, dialogue, and conversation, for the codification of ICT, lessons learned, and best practices (Figure 7).

In architectural companies, Kloosterman (2008) analyzed sticky and leaky processes at three levels: *'between units in the same firm'* (Maggioni et al., 2011; Malsch and Guieu, 2019) as *"inter-firm networks",* between different organizations as *"mobile labor pool"* (Kim et al., 2014), and institutional structures (Chen et al., 2019) *"dedicated institutions".* In Rotterdam and Amsterdam, there is a lack of collaboration between firms, while intense knowledge transfer is driven by individuals changing companies. Academic schools and associations, create additional social connections as a way of connecting generations of workers, facilitating fast and informal knowledge exchange, such as competition results (Kloosterman, 2008).

2.2.5 Opportunities and Obstacles of knowledge-sharing in Architectural Offices
This chapter will outline the main components and obstacles to knowledge-sharing.

Opportunities:

Many researchers emphasize **trust** as a fundamental component of knowledge-sharing (e.g., Nonaka, 1994), which highly depends on individual factors and company organizational parameters. The **articulation capacity** of the knowledge emitter and the **absorption capacity** of the knowledge recipient (Yepes & Lopez, 2021) are the two most crucial human factors. At the same time, continuous **dialogue** (Nonaka, 1994), **reciprocity, mutual respect, common interests,** and **strong ties** (Bashouri & Duncan, 2014), are important as well. Researches also highlight **emotional intelligence** (Lester, 2022) **individual attitudes** (Wang & Noe, 2010), and considerations of **self-interest** and **social responsibility** (Zhang & Sun, 2020).

On the organizational level, several factors play a role in facilitating KS. These include the **organizational and ethical climate, corporate culture**, and structure, as well as **motivation of the employees, rewards, and incentives** (Wang & Noe, 2010, Riege, 2005). Moreover, the **physical environment**, including organized **face-to-face settings** (Bektas, 2013), **legal and professional codes**, as well as **knowledge leadership**, further contribute to the organizational context (Zhang & Sun, 2020).

Obstacles:

The key barriers to effective KS can be also categorized by organizational, personal, and technological factors (Riege, 2005). Human factors cause the absence of trust as a result of three core issues: the **lack of absorptive capacity of the recipient, causal ambiguity**, and an **arduous relationship** between the source and the recipient (Szulanski, 1996). Furthermore, the phenomenon of k**nowledge contribution loafing (KCL)**, influenced by personal input, has been extensively explored in an Asian context by Zhang and Sun (2020). Organizational factors, as outlined by various scholars, comprise a barren organizational context (Szulanski, 1996), a **shortage of incentives** (Wang & Noe, 2010), a **lack of experience, brain drain, frequent job changes, and restricted access to resources** (Lester, 2023). Additionally, **social loafing, characterized by an unhealthy ethical climate**, has been examined by Zhang and Sun (2020).

In the built environment, KS faces challenges where other factors, such as **delivery times, organizational structure, organizational culture, and tacit knowledge maintenance**, often take precedence over the transfer of knowledge (Yepes & López, 2021). In architectural firms, design errors are predominantly attributed to a **lack of knowledge, inexperience**, and **insufficient training**, as reported by Love et al. (2011).

Enhancement tactics

Along with various frameworks, tactics for enhancing knowledge-sharing have been examined. Techniques such as **storytelling, dialogue, conversation, ICT**, and **lessons learned**, along with **best practices**, have been previously discussed. Cabrera and Cabrera (2005) introduced 24 people management practices across seven categories to foster knowledge-sharing (Table 2). Additionally, Kazi (2005) suggested specific "Organisational Knowledge-Sharing Practices" for the construction industry. These include Informal **Knowledge Workshops, Knowledge Exchange Seminars, Departmental Meetings, Site Visit Programmes, Summary Reports, a Project Award Scheme, Coaching and Mentoring, an Intranet and E-Library**, and the creation of **knowledge teams**. Highlighting other people-centric tactics, Mark (2002), Garcia et al. (2004), and Berends et al. (2006) examine the concept of **co-locating** design teams. Co-location aims to establish a physical space where essential professionals from various organizations participating in projects can convene, as described by Kahn et al. (1997).

Work design	Teams/cross-functional teams
	Interdependency
	Communities of practice
Staffing	Person–organization fit
	Employee referrals
	Communication skills
Training and development	Extensive training
	Team-based/cross-training
	Formalized orientation and socialization programmes
Performance appraisal	Developmental evaluations
	Include knowledge-sharing criterion
Compensation and rewards	Reward knowledge-sharing behaviours
	Intrinsic rewards
	Group and firm-based compensation systems
Culture	Knowledge-sharing norms
	Culture of caring (trust and cooperation)
	High band-width communication
	Egalitarianism
	Fairness
	Perceived support
Technology	User-friendly information technology
	Training to use technology
	Technology chosen to fit culture
	Technology to enhance existing social networks

Table 2:
People management practices proposed to foster knowledge-sharing.
Source: Cabrera and Cabrera (2005)

2.2.6 Conceptual Model on Knowledge-sharing in Architectural Offices

In order to understand the complexity of knowledge-sharing processes, this chapter provides an overview of the parameters, included in this field. Those parameters are summarized in Figure 8.

First of all, all the knowledge-sharing processes in architectural studios can be divided by the type of communication, namely *direct* and *indirect* (Bektas, 2013). *Indirect communication* includes *tools* and *artifacts*. *Tools* can be further categorized by *IT* and *non-IT* (procedures, formal and informal interventions, and enhancement tactics) perspectives. *Artifacts* as objects in architectural offices are associated with '*boundary objects,*' as they become central to negotiations and power dynamics, especially in interactions among different professional groups (B. A. Bechky, 2003). "*Boundary objects are those objects that both inhabit several communities of practice and satisfy the informational requirement of each of them*" (Bowker and Star, 1999, p. 297)" Objects can also serve as '*technical objects,*' providing stable knowledge frameworks for ongoing work, or as '*epistemic objects,*' which direct the processes of knowledge development and learning and are continuously modified by these processes (Ewenstein and Whyte, 2008).
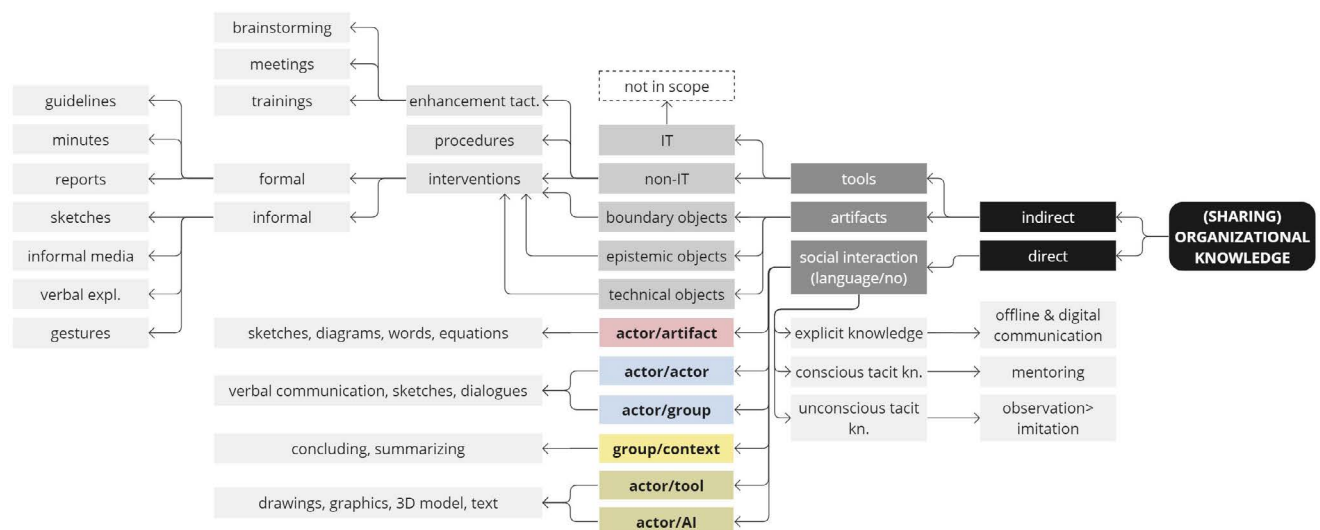
Figure 8. Knowledge-sharing parameters.
Source: by author

Direct communication is defined through social interaction, whether it's happening with or without the use of language. According to (Robin et al. 2007). there are 4 main types of interaction. The first one happens between *actor and artifact,* through individual work with sketches, diagrams, words, and equations. The second and third types relate to the interaction between *actor and actor* or *actor and group*, this collective process is happening through verbal communication, sketches, and dialogues. While the fourth type happens within a *group and context*, through concluding and summarizing. All 4 types of interaction ensure that the knowledge is shared within the project.

In order to create an efficient strategy it's not enough to consider strengthening only human factor (HRM) or information technology (ICT) processes, as only integrated methodology between those two would balance an approach. At the same time, literature refers to the importance of the contextual and procedural domains. Bektas (2013) in her study of knowledge-sharing tactics for complex buildings refers to 4 domains in her *"knowledge diamond framework"* (Figure 9) which are *physical settings, tools, procedures,* and *social practices*. Where the physical setting refers to its contextual (virtual or physical) setup. The tools domain specifically refers to IT, while procedures to non-IT interventions and boundary objects. Social practices refer to the human factor, which links all 4 domains together.

Figure 9.
Four dimensions of Knowledge Sharing Strategies in Large Complex Buildings (based on the Activity Theory)
Source: Bektas (2013)

For this study, the modified version of the knowledge diamond from Bektas (2013) has been proposed. The *physical settings* have been converted to *context*, as it has to reflect not only on face-to-face arrangement during the knowledge-sharing but also refers to the internal and external environment. The *procedures* have been converted to *artifacts*, as they include boundary, epistemic, and technical objects (Ewenstein and Whyte, 2008) and the interaction of architects with those. The *social practices* and *tools* stay as they were in Bektas's framework.

As Figure 10 outlines, due to growing significance of AI, this additional dimention is proposed for this research. 6 different types of interaction have been introduced, they correspond to the perspectives of the '*knowledge diamond*', where '*context*' includes interaction between '*group-context*', '*social practices*' includes interaction between '*actor-actor*' and '*actor-group*' (actor-actor also includes processes of thinking and reflection in self-interaction), '*artifacts*' include interaction between '*actor-artifacts*' and '*tools*' perspective include '*actor-tool'* and '*actor-AI'* interaction. The interaction perspectives should be seen on multiple levels, starting from individual interaction, to intra- and inter-organizational.
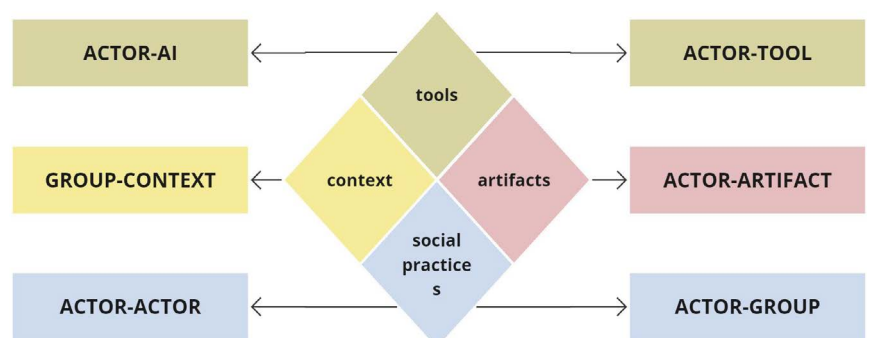
Figure 10.
Four dimensions of Knowledge Sharing in architectural practices
Source: by author

2.2.7 Conclusions on Knowledge-sharing and Knowledge Management

RQ 2: How does **knowledge sharing** influence ongoing transitional processes in architectural practices?

This chapter underscores the significance of an effective Knowledge Management (KM) strategy, balancing the integration of Information and Communication Technology (ICT) and Human Resource Management (HRM). As Cabrera & Cabrera (2005) assert, the dynamism of today's competitive environment necessitates organizations to continually renew their knowledge assets, making knowledge about transitions vital. This is particularly pertinent in the architectural field where strategy intertwines with customization and aesthetics, elements crucial to the profession.

The need for a holistic framework for managing this knowledge becomes evident. In the context of the construction industry, as noted by Yepes and López (2021), KM serves as a transitional element, bridging traditional processes with the demands of technological change. This transition is not just about the adoption of new technologies but also about fostering a culture where knowledge-sharing across communities contributes significantly to organizational learning and innovation, as highlighted by Brown and Duguid (1998), and Wang and Noe (2010). Knowledge-sharing as a part of knowledge management is proposed to be presented in 4 dimensions though the framework of the *knowledge diamond*, namely *social practices* (Actor-actor, actor-group interactions), *artifacts* (actor-artifact interaction), *tools* (actor-tool, actor-AI interactions), and *context* (Group-context interactions).

2.3 Knowledge-Sharing Tactics to cope with Transitions

This chapter provides an answer based on theoretical studies on RQ 3: What **knowledge-sharing tactics** can be drawn to **cope with** ongoing and future **transitions** in architectural offices?

This chapter is structured as follows (1) first, the literature concepts, bridging the domains of *'transition'* and *'knowledge'* will be highlighted (2) a proposal of the research framework based on the mentioned concepts will be introduced, (3) the approach towards identification of knowledge sharing tactics is proposed.

2.3.1 Traditional vs. transitional approach to Knowledge Management

Looking for bridging concepts between '*transitional change*' and knowledge sharing, several potential overlaps have been found. The first assumption was that there might be a correlation between the roles in the process, as papers refer to the figures of '*transitional change agent*' (Amado and Ambrose, 2018) and '*knowledge broker*' (Styhre, 2009). However, no functional overlap has been identified between these two roles in the context of Dutch architectural practices. The second hypothesis was related to artifacts, as '*transitional*' (Amado and Ambrose, 2018) and '*boundary*' objects (Whyte et al., 2008) both play important roles in the processes; in fact, their functions, according to the literature, also appear to be different.

The overlapping field of the concepts has been found in the area of '*organizational learning*'. Along with the theoretical review, two opposing approaches have been identified as modes of organizational learning, namely the *traditional approach* (referring to the works of Nonaka) and the concept of *expansive learning* (Engeström, 2021), which correlates with the *transitional approach* of Amado and Ambrose (2018) discussed in section 2.1.2.

Traditional approach to knowledge management

The traditional approach applied to the built environment has been proposed by Senaratne & Sexton (2008) as a Knowledge-based project change process, based on Nonaka's framework of knowledge creation as its reaction to change in the construction process (Figure 11). This model, reflecting the project-based approach, incorporates two distinct levels: *intra-project* and *inter-project*. The intra-project level refers to activities conducted within a single project, while the inter-project level pertains to activities across multiple organizational projects. He underlined the importance of '*deep internalization*', and '*apt codification*', and strengthened social networks and face-to-face settings, for the creation of '*double-loop*' personalization. He concluded that the success of a knowledge-driven project change process hinges on redirecting focus from the technical aspects within a single project to the social dynamics across multiple projects.
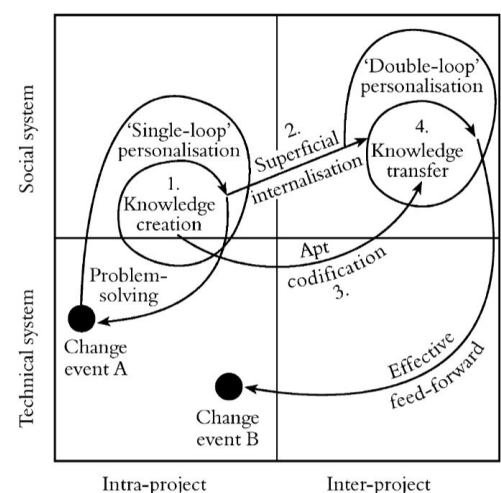
Figure 11.
Knowledge-based project change process.
Source: Senaratne & Sexton (2008)

The limitations of cyclic models and traditional organizational learning theories are highlighted in Engeström's critique of models like Nonaka and Takeuchi's framework of cyclic knowledge creation. He points out that these models often assume knowledge creation directives are top-down, predefined by management without local process involvement, leading to a structured, conflict-free knowledge conversion that may not reflect real-world organizational complexities. Additionally, traditional learning theories presuppose the acquisition of stable, well-defined knowledge, often facilitated by a competent 'teacher.' However, in dynamic work environments, much learning involves undefined, unstable knowledge that must be understood and

developed in real-time, without the guidance of an established expert. This challenges the effectiveness of standard learning models in scenarios where organizations must innovate and learn new forms of activity that are not yet fully conceptualized, underscoring the need for a more expansive and adaptable approach to understanding organizational learning.

Tripple-loop organizational learning

Gregory Bateson's (1972) theory of learning stands out as one of the few methods effective in addressing this challenge. According to Amado & Ambrose (2018), levels of change can be likened to Argyris and Schön's (1978) concepts of *single-loop*, *double-loop*, and *'triple-loop'* organizational learning (Swieringa and Wierdsma, 1992). The first level refers to *'doing things right',* and the second to '*doing the right things'*. The third is about reflecting on how the organization decides what is *'right*' and potentially changing our ways of learning and understanding. In other words, it examines how external transitions are perceived and critically assessed at the level of the firm's positioning and sustainability (Bashouri & Duncan, 2014a)." (Figure 12)

Expansive learning
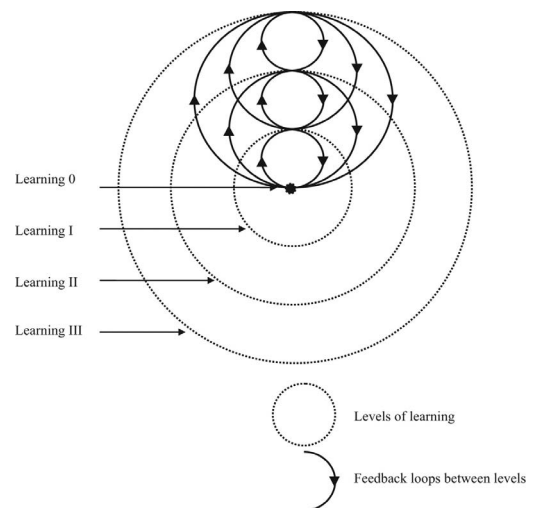
Figure 12:
Bateson's levels arranged as a recursive hierarchy.
Sourse: Bateson (1973)

Developing Bateson's ideas further and contrasting to traditional cyclical modes of organizational learning, Engeström (2001) discussed the concept of expansive learning (Figure 13), shaped as an open upward spiral. This involves a critical reassessment of existing practices through conflictual questioning, leading to the development of new, culturally innovative work patterns. This process not only challenges the traditional vertical orientation of learning, which focuses on ascending to higher levels of competence but also introduces a *complementary approach* of horizontal or sideways development. This alternative dimension emphasizes learning that expands capabilities across different contexts rather than solely upwards, producing transformative changes in work activities and contributing to broader cultural developments.

Therefore, the key difference between traditional and transitional organizational learning lies in the perspec-
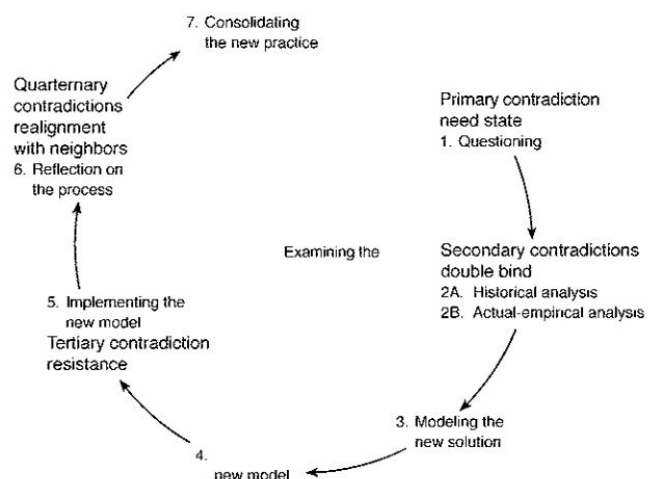
Figure 13:
Strategic learning actions and corresponding
contradictions in the cycle of expansive learning.
Source: Engeström (2001)

tive of centralized versus decentralized approaches and the sequence of steps in which the method is implemented. In the first case, the sequence is *thinking-saying-doing*, which refers to a direct top-down organizational strategy. In contrast, the second approach, positioned as an alternative, follows a *thinking-doing-saying* sequence. This requires more bottom-up initiatives and attempts to test the final strategy before it is implemented at the organizational level. This difference need to be taken in account during the empirical research to identify which patterns will appear.

2.3.2 Research Framework KS tactics to cope with transitions

Various approaches to coping strategies have been summarized by Stanisławski (2019), emphasizing coping strategies as responses to stress. For this research, the classification by Parker and Endler (1992) into *Task-Oriented, Emotion-Oriented*, and *Avoidance-Oriented Coping* has been identified as more straightforward to apply. The first type pertains to problem-solving, the second focuses on managing emotions, and the third category encompasses both Task-Oriented and Emotion-Oriented perspectives. *"Task-oriented avoidance is conceptualized as distraction, while person-oriented avoidance takes the form of social diversion."* (Stanisławski, 2019, p. 3).

Coping strategies primarily relate to individual perceptions, which poses a challenge in scaling these strategies to the organizational level. In this research, the general behavioral pattern from all individual efforts and strategies will be considered at multiple levels, assuming that individuals in higher organizational positions, along with their personal coping strategies, exert greater influence on the chosen approach to managing transitions.

As for the knowledge-sharing tactics (KST) to cope with transitions (Figure 14), there are several conditions for its selection. First, tactics that do not correspond to transitions or knowledge-sharing are not included in this selection, second, those tactics should also be measurable through 4 perspectives of the knowledge diamond. Third, KST should be categorizable by the level of interaction, where *XL* corresponds to the *inter-organizational level, L-S* corresponds to the *intra-organizational* (L as the organization itself, M as a department, or in the case of KAAN Architecten, project-bubble (a group of projects overviewed by 1 responsible managing architects (Section 4.1.1 provides more detail on the organizational structure))), S as a project level) and *XS* corresponds to an *individual level.* Finally, the tactics themselves, and their order should be determined by the empirical research (section 4.5) and the discussion (section 5.3).
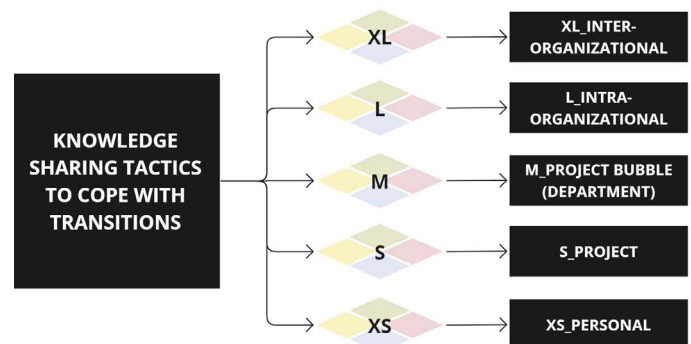
Figure14.
Levels of the knowledge-sharing coping tactics.
Source: by author

2.3.3 Conclusion on KS tactics to cope with transitions in Architectural Offices
RQ 3: What **knowledge-sharing tactics** can be drawn to **cope with** ongoing and future **transitions** in architectural offices?

It has been discovered that the concepts of transitions and knowledge sharing overlap in the area of *"organizational learning."* It has also been identified that two distinct approaches to organizational learning exist: *traditional* and *transitional* (based on expansive learning). The former is cyclical and typically implemented at the level of top-down organizations with the sequence of thinking-saying-doing steps. While the second is more applicable to bottom-up initiatives and align with doing-thinking-saying steps. Both approaches will be evaluated during the empirical research to determine which tactics are suitable for architectural practices and to understand the sequence of steps in the process. The necessity for a comprehensive framework that reflects *intra-, inter-,* and *individual* organizational levels has been proposed to address the subject's complexity and to adopt a socio-technical perspective.

2.4. Research framework
2.4.1 Knowledge about Transitions framework

This chapter proposes a full theoretical framework for the conceptual model.

By distilling the ideas from the above-mentioned concepts, and building upon the outcome of chapters 2.1 -2.3, a new framework has been proposed (Figure 15). The concepts of *'transitions in architectural practices'* and '*knowledge-sharing coping tactics'* are connected through a modified version of the knowledge diamond from Bektas (2013).

3 Frameworks *'Transitions in architectural practices', 'Knowledge diamond'*, and ' *Knowledge-sharing coping tactics'* correspond to the order of 3 sub-questions and together form an iterative framework (Figure 15), where knowledge-sharing tactics help to cope with ongoing transitions and trigger the future once.

In order to come up with a further step on specific tactics, it is proposed to discover them though empirical research and understand which of those knowledge-sharing tactics has been used to cope with each transition. It is also important to understand, what were the triggers of those transitions, who was the initiator of starting this change, how it has been experienced by different members of architectural practice, as well as which levels have been involved or affected by those transitions.

The next chapter will explain the method, and how this research is going to be conducted.

2.4.2 People management practices (PMP), categorized by the knowledge diamond

Concerning *'people management practices,'* the items identified in the research by Cabrera and Cabrera (2005) and Kazi (2005), outlined in section 2.2.6 and illustrated in Figure 16, have been categorized according to the perspectives of the knowledge diamond. These items will be examined as enhancers of coping strategies, and their effectiveness will be assessed through empirical research. The relevant items will be summarized as opportunities in Appendix F, while specific people management practices corresponding to each coping strategy will be detailed based on the correlations identified through empirical research and presented in the recommendations for industry stakeholders in the conclusion section.
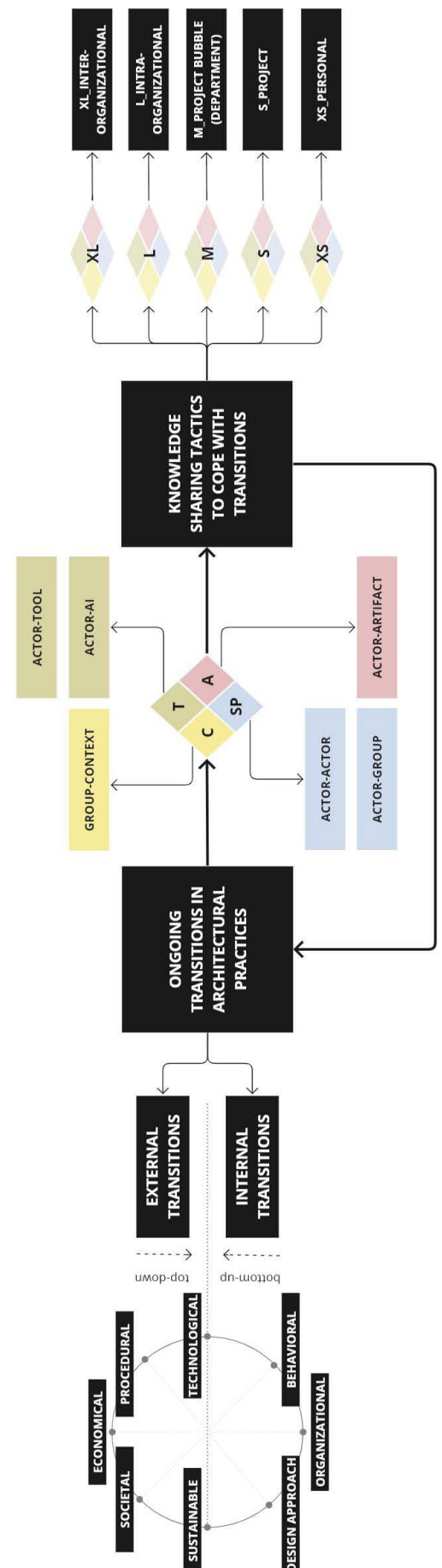
Figure 15.
Research conceptual framework.
Source: by author

Physical Settings	Talk Space
	Space for face-to-face communication
	Site Visit Programme
	Co-location
Technology	User-friendly information technology
	Training to use technology
	Technology chosen to fit culture
	Technology to enhance existing social networks
	Intranet and E-Library
Training and development	Extensive training
	Team-based/cross-training
	Formalized orientation and socialization programmes
	Informal Knowledge Workshops
	Knowledge Exchange Seminars
	Departmental Meetings
Performance appraisal	Reward knowledge-sharing behaviours
	Developmental evaluations
	Summary Reports
Compensation and rewards	Include knowledge-sharing criterion
	Intrinsic rewards
	Group and firm-based compensation systems
	Project Award Scheme
Culture	Knowledge-sharing norms
	Culture of caring (trust and cooperation)
	High band-width communication
	Egalitarianism
	Perceived support
	Coaching and Mentoring
Work design	Teams/cross-functional teams
	Interdependency
	Communities of practice
	knowledge teams
Staffing	Person – organization fit
	Employee referrals
	Communication skills

Figure 16.
People management practices (PMP),
categorized by the knowledge diamond
Source: by author

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research design
    3.1.1. Case study design
3.2 Data collection techniques
    3.2.1. Literature Review: Desk research
    3.2.2 Empirical research: Case studies
3.3 Data analysis
3.4 Data creditability
3.5 Data plan
3.6 Ethical considerations
3.7 Research output
    3.7.1 Goals and objectives
    3.7.2 Deliverables
    3.7.3 Dissemination and audiences
3.8 Personal study targets

RESEARCH METHODOLOGY

In this chapter, the research methodology designed to answer the research questions is explained. It describes the research in terms of (1) the research design, (2) data collection, (3) data analysis, (4) data creditability, (5) data plan, (6) ethical considerations, (7) research output, and (8) personal study targets.

3.1 Research design

To answer the research questions, *exploratory qualitative research* has been selected, as a tool *"to provide information for critical design decisions"* (Blaikie and Priest, 2019, p. 93) and to *"enhance understanding of the context of events as well as the events themselves"* (Sofaer, 1999, p. 1102). The *abductive logic of inquiry* has been chosen to *"entail the use of hypotheses in the course of generating theory [...] and answer to questions that emerge as the research proceeds"* (Blaikie and Priest, 2019, p. 21).

The research is designed in three phases, involving a theoretical study, an empirical research phase, and a synthesis and conclusion phase. Figure 17 displays the research methodology framework with these phases according to the P terms, the selected method, the data collection technique for each phase, the relationship with each research question, and the expected outcome.

Phase I

The first phase covers the theoretical study part of the research and focuses on collecting state-of-the-art knowledge for answering subquestions 1, 2, and 3 based on secondary data. It also serves as a foundation for formulating a draft of a theoretical framework and determining the scope and criteria for further case study research. The outcome of this phase can be seen in Chapter 2 of this document.

Phase II

The second part concerns the empirical part of the research and focuses on answering subquestions 1,2 and 3 based on primary data. The qualitative research will be done through the case study of KAAN Architecten, using archival research, observations, and semi-structured interviews in order to analyze the outcome on the organizational, project, and personal levels. The theoretical framework will be further developed and refined, based on the comparison of theoretical and practical data. The outcome of this phase can be seen in Chapter 4 of this document.

Phase III

The third part focuses on the synthesis and conclusion. The research validity will be done through triangulation between data collection techniques and further checked through internal discussion with the research participants. Coping tactics will be formulated as an outcome of the research. The results of this part can be seen in Chapters 5, 6, and 7.

Figure 17: Design methodology framework Source: by author
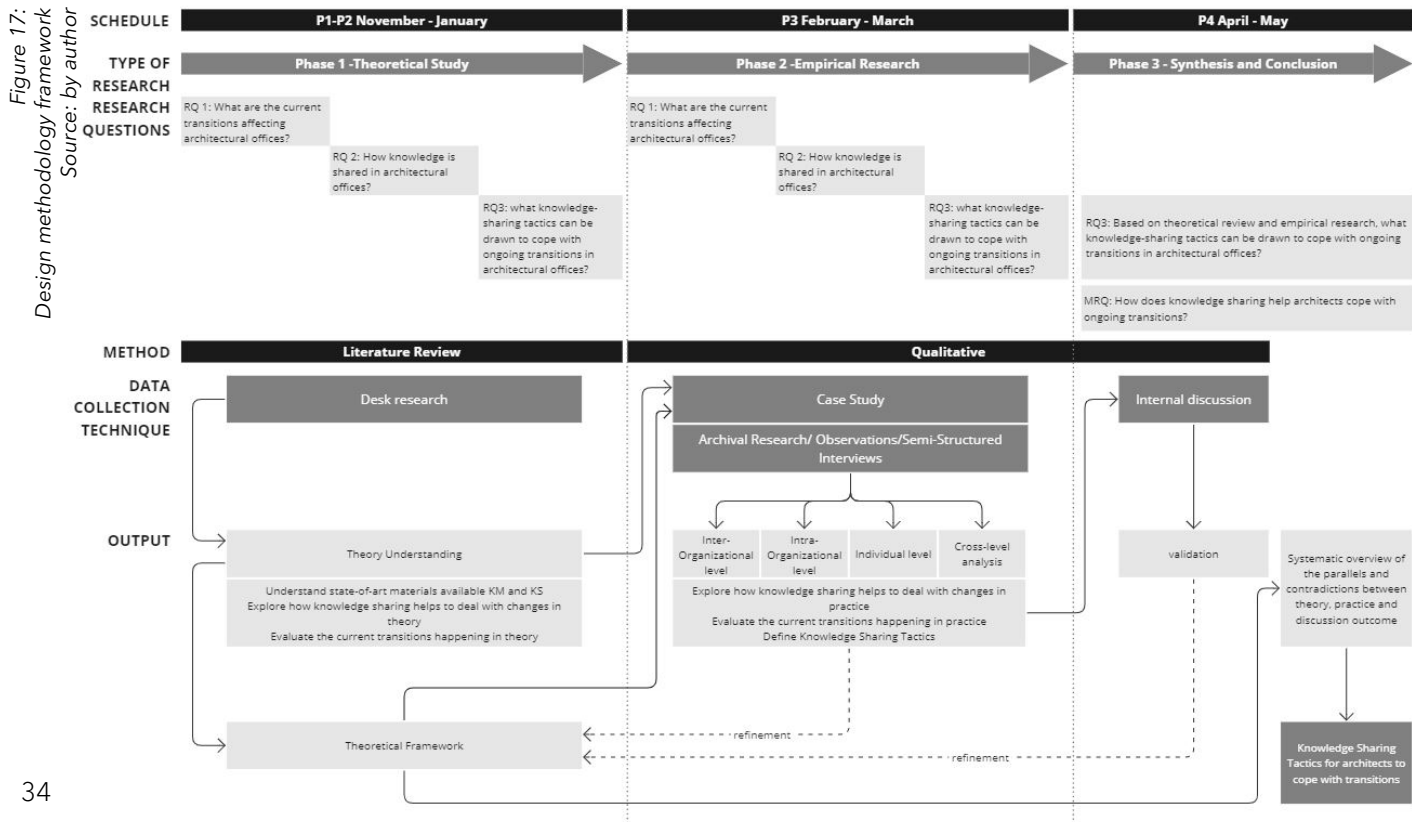
3.1.1. Case study design

An *embedded single-case study design* (Type 2, Figure 18) has been chosen as it *"can represent a significant contribution to knowledge and theory building by confirming, challenging, or extending the theory."* (Yin, 2018, p.85). KAAN Architecten as an organization is a unit of analysis in this study, while organizational teams and employees are the subunits of analysis, which *"can often add significant opportunities for extensive analysis, enhancing the insights into the single-case."* (Yin, 2018, p.90).
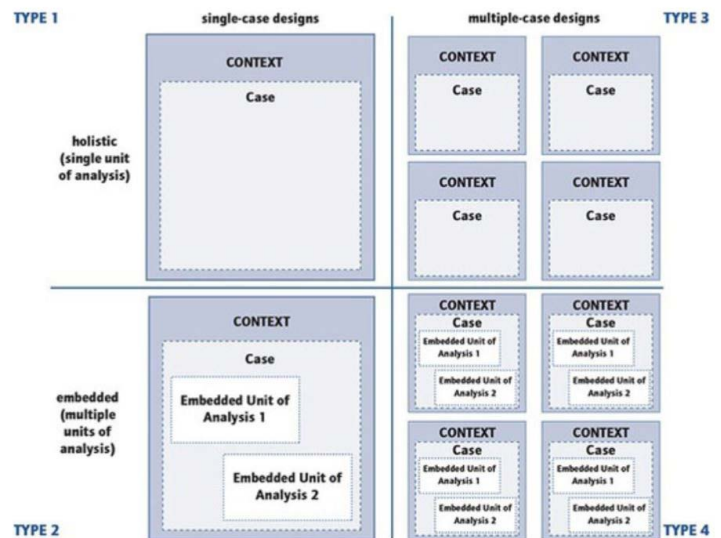
Figure 18.
Basic Types of Design for Case Studies
Source: Yin, 2018

Case study selection criteria

Individuals with different roles in organization has been chosen as a smallest sub-unit of analysis on *individual level (XS)*, while *project teams* belongs to *S* level and *cross-department* interactions to *M* level. *Multi-stage sampling* has been applied, with criteria outlined in Table 3. First *cluster sampling* was chosen to define which organizational teams are involved in the knowledge-sharing process and take decisions regarding essential actions toward potential transitions. In the second stage, *stratified sampling* was chosen to define a larger variety of participants' ages and working experience, as well as recent experience in dealing with a particular transition.

| | | cluster sampling | | | | |
Criteria	Partners	Management team	Business development	Design team	BIM managers	External collaborators
Organizational transition	✓	✓	✓	✓	✓	✓
Behavioral transition	✓			✓	✓	
Project approach	✓	✓		✓	✓	✓
Sustainable transition	✓	✓	✓	✓		
Technological transition	✓			✓	✓	✓
Societal transition	✓		✓	✓	✓	
Procedural transition	✓	✓	✓		✓	✓
Economical transition	✓	✓	✓		✓	
Interaction: social practices	✓	✓	✓	✓	✓	✓
Interaction: tools	✓			✓	✓	✓
Interaction: artifacts	✓	✓	✓	✓	✓	
Interaction: context	✓	✓	✓	✓	✓	✓

Table 3.
Case studies selection criteria
Source: by author

3.2 Data collection techniques

The data collection techniques in this study are *desk research* and *case study*. While desk research is chosen to build up a theoretical knowledge understanding and draw up a framework draft, case study research in contrast will focus on the practical application and look for similarities/ contradictions to theory. The following sections explain each instrument in detail.

3.2.1. Literature Review: Desk research

This desk research has been done according to the method proposed in the Literature Review Assignment of the RM2 course (Koolwijk, 2023). First of all, the search for the articles has been done by keywords through Scopus, Google Scholar, TU Delft online library, TU Delft repository, and researchrabbit.ai. The selection has been based on the number of citations and year of publication. Collected articles also were related to current approaches, methods, and mechanisms and state-of-art literature review of topics *'knowledge'* and *'transitional change'.* Certain fundamental works on general management theory have been suggested by the researcher's mentor Paul Chan, such as Nonaka (1994), Brown & Duguid (2001), and Szulanski (1996).

Secondly, all the articles have been stored in Zotero (literature organizing software), for the convenience of accessing the information, categorization, labeling read/unread articles, scoring them, reading, and highlighting the comments. Thirdly, the mandatory reading list was done by sorting all the articles a second time by the read/probably read/not read literature survey list (Shady Attia, 2015). This step helped to choose specific articles that had the highest number of citations and the articles that were published within the last 5 years, which was done by reading the introductions and brief scanning.

Fourthly, the selected articles have been read in detail, and the notes have been taken along reading. The literature review matrix has been filled in along with reading the article one by one. Further, the literature review synthesis matrix has been done by revising the notes in the articles and looking for similarities and contradictions between the papers. Finally, based on the literature review synthesis matrix, the final text has been written.

The outcome of the data gathered from this technique was the development of the selection criteria for the case studies, as well as a draft of the theoretical framework that is used to support the data collection and analysis of the empirical part of this research.

3.2.2 Empirical research: Case studies

Table 4 outlines the schedule of the empirical research, indicating a data-collection plan per week. The study will be first focused on working with the Business Development and Process Management team, followed by Project Teams.

Table 4.
Schedule of the empirical research
(Source: by author)
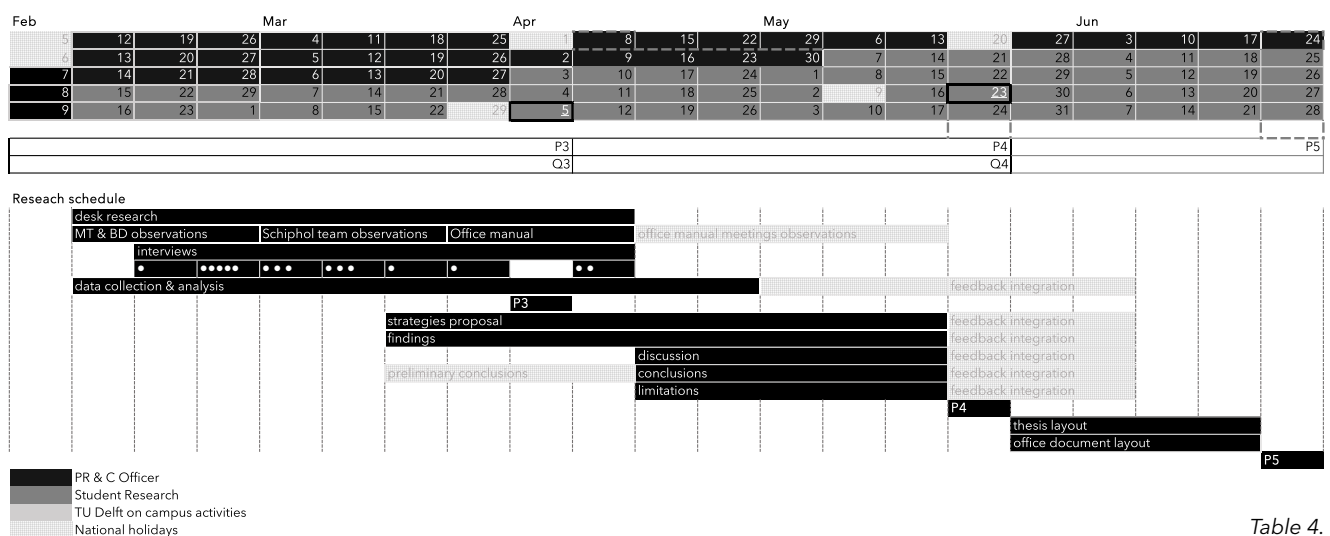
The case studies research proposed a balanced approach between 3 instruments: archival research, observations, and semi-structured interviews. It will focus on inter, intra-organizational and individual levels.

The *inter-organizational level* will be studied through shadowing, archival research, and interviews with partners, management team and BD.
The *intra-organizational level* will be studied through shadowing of the project team, archival research, and interviews with research participants.
The *individual levels* will be studied through interviews with research participants.

Archival Research
Archival research is selected as the first step of empirical research. It serves as a basis for semi-structured interviews and observations, for a deeper understanding of the KAAN Architecten context, organizational structure, procedures, and ongoing projects and processes. The outcome of Archival research can be seen in Chapter 4.2 of this document.

Semi-structured interviews
Semi-structured interviews are selected as data collection techniques as they *"can get close to the social actors' accounts of the social interaction in which they have been involved, and to their meanings and interpretations"* (Blaikie and Priest, 2019, p. 217). The questions for the interviews are prepared in advance and divided into topic frames, however, the order and specificity of questions are flexible (Research Methods and Statistics, 2016). The generic list of interviews (Table 5) has been formed, based on KAAN Architecten organizational structure (Chapter 4.2) The full interview protocol can be seen in this document in Appendix A.

Interview	Participant role in organization
1	Partners (1)
2	Management team (4)
4	Business development (1)
4	Architects (6)
5	BIM managers (3)
6	External Collaborators (1)

Table 5.
Interview schedule
(Source: by author)

Observations
Observations are selected as data collection techniques. Shadowing is chosen to develop a deeper understanding of the processes of knowledge-sharing and dealing with changes within office teams (Kevdzija, 2023). These observations will be conducted during on-site visits to KAAN Architecten, by shadowing twice a week meetings of a particular project team.

The researcher will be present during the whole meeting and will be focused on collecting the following data:

- ongoing changes in the project and their triggers, which the team is currently facing,
- the behavioral patterns as a response to the changes, information flow between the participants
- agreements for further actions and task distributions.

Audio recordings will made on an external device. Along with the audio recordings the observation approach consists of the following procedures (DeWalt and DeWalt, 2011):

"During the meetings, the researcher makes jot notes in the small notebook, which are the words, phrases, or sentences that are recorded during the course of a day's events as primarily aids to memory" (Musante (De-

Walt) and DeWalt, 2011, p. 172). In the same notebook, the researcher keeps logs, which consist of the schedule of the day and the questions list, which appears during the day. Evening of the same day, the researcher writes proposer field notes, with detailed and descriptive explanations of the situations, activities, peoples' appearances, emotions, gestures, and jargon used. Along with those the researcher also fills in methodological notes with recommendations on how the observation process can be improved and what she needs for that. In addition to that, the researcher writes a diary with personal reflections on the daily experiences. Finally, the researcher reviews the notes, uploaded to atlas.ti software weekly and write meta-notes along all the files, which include *"comments, <…>interpretations, hypotheses, and questions for further research"* (Musante (DeWalt) and DeWalt, 2011, p. 182)

Collected notes and audio recordings will be compared to the secondary data (presentations, internal meeting notes from the observed team) to minimize bias. The observations will take 3 working weeks, where the researcher will follow the internal meetings of your project team at KAAN Architecten. In particular, the researcher will be present at Monday weekly updates meetings (1h) and on Wednesday progress meetings (2,5h). The data colleaction will be structured according to Table 6.

Parameter	Outcome
Number of people	—
Purpose of interaction	knowledge exchange/ socialization...
Participant role	For example: PM, BD, Architects
Activity	For ex: catch-up meeting
Knowledge involved	tacit/ explicit
Causes for KS	comments on KS
Obstacles for KS	comments on KS
Challenges of the day	comments on daily reactions of reacting to change
Interval	3 weeks, meetings 0,5-2 h, 3 times per week
Opportunities for KS	comments on KS

Table 6.
Observations schedule
(Source: by author)

3.3 Data analysis
In order to achieve a higher rated quality of a case study, the data from multiple sources of evidence will be gathered and data triangulation will be applied (Yin, 2018) by constructing the funding, based on literature review, archival analysis, observations and semi-structured interviews.

The data analysis will be done by using ATLAS.ti software and include closed and open coding. The final codes list can be seen in Appendix E. The data for each subunit as a level of analysis (inter, intra-organizational and individual levels) will be first collected individually and analyzed within a closed coding system and a draft of the research framework, while open codes will be added for the new information. After the individual analyses are finalized, the case study will go back to the original unit of analysis and develop a holistic understanding of the case by comparing the findings from subunits (Yin, 2018) as a cross-sectional analysis. Based on the outcomes, the research framework will be finalized using an abductive approach.

3.4 Data creditability
Qualitative research often involves a degree of subjectivity not present in quantitative studies, as researchers may interpret findings differently (Burnard et al., 2008). To enhance the credibility of the findings methods from Shenton (2004) has been integrated (Table 7). This process also involved conducting internal discussions with interview participants. The research methodology thus integrates desk research, case studies, and internal discussions. For the internal discussions, 10 participants were engaged to review and assess the empirical findings. This approach was chosen due to the participants' familiarity with the ongoing research and to facilitate open dialogue among them, further enriching the research process.

Quality criterion	Possible provision by Shenton (2004)	Implementation in this research
Credibility	Adoption of appropriate, well recognised research methods	In-depth interviews and observations help to perform an explorative study with an abductive logic of inquiry
	Development of early familiarity with culture of participating organisations	before 3 months of empirical research, the researcher will start a trainership in the company, 3 month in advance
	Triangulation via use of different methods, different types of informants and different sites	Multiple research methods (in-depth interviews and observations) and internal results validation workshop are used to compensate for the other's limitations
	Tactics to help ensure honesty in informants	Participants can always withdraw without giving a reason and the researcher will have an independent status
	Member checks of data collected and interpretations/theories formed	The participants are always allowed to check the results of the interviews and observations
Transferability	Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made	The context of the research will be described as thorough as possible, including characteristics of the organization and environment
Dependability	In-depth methodological description to allow study to be repeated	The research methods, operation of the research methods, and evaluation will be described in detail
Confirmability	Triangulation to reduce effect of investigator bias	See 'Triangulation' in 'Credibility', internal results validation workshop
	Admission of researcher's beliefs and assumptions	consultations with researchers mentors, self-reflection
	Recognition of shortcomings in study's methods and their potential effects	see limitations section

Table 7
Creditability measurements
Source: by author (Based on Shenton 2004)

3.5 Data plan

All the data is going to be stored according to FAIR principles namely findability, accessibility, interoperability, and reusability (Wilkinson et al., 2016).

1. To be sure that data is Findable, keywords are defined and it will be described with meta. A persistent identifier (DOI) will be given to the publication, which will be available through a search engine and will be placed in the repository of TU Delft (4TU.ResearchData). The data gathered from different sources within this research will be properly referenced using APA 7th to facilitate the findability of the sources used.

2. To be sure that data is Accessible, the repository of TU Delft will provide a DOI link. Metadata will be available to everyone who has access to the platform.

3. To be sure that data is Interoperable: the structure of the data will be described in the methodology of data collection. The keywords will be collected in the data dictionary. Data is available in English and uses *"a formal, accessible, shared, and broadly applicable language for knowledge representation"*(Wilkinson et al., 2016).

4. To be sure that data is Re-usable: all the data is structured and documented (for the details check Data Management Plan)

Data Management Plan can be seen in Appendix G, it has been reviewed twice and approved by data steward on.

3.6 Ethical considerations

Research design is based on principles of research ethics, such as *'do not harm', 'informed consent', 'quality of data',* and '*use of data and confidentiality*' (Chan, 2022). The chosen research instruments are designed with consideration to protect human participants. Since there is a risk of damaging one's career development,

conducted observations and interviews are going to be are pseudonymized. Data management Plan in Appendix G in detail explains this process. The consent form for interviews, observations and internal workshop with research participants works as legal ground and provides permission to collect participants' data (For the explicit consent points check Appendix B, C, D).

3.7 Research output
3.7.1 Goals and objectives
This research aims to reveal how architects cope with ongoing transitions in the industry through knowledge-sharing, by defining coping mechanisms on inter-, intra-organizational and individual levels and summarizing them in knowledge-sharing tactics. Therefore, the research objectives include:
- Exploring how knowledge is managed and shared in architectural offices in theory and practice.
- Understanding how knowledge-sharing helps architects deal with changes and what lessons can be learned regarding future challenges.
- Summarizing the current transitions affecting architectural offices through theoretical and practical findings.
- Based on literature and empirical findings, drawing knowledge-sharing tactics for architects to cope with ongoing and future transitions.

3.7.2 Deliverables
The deliverables of this research will consist of the development of a set of knowledge-sharing tactics for architects, to cope with ongoing and future transitions on inter-, intra-organizational and individual levels.

3.7.3 Dissemination and audiences
The outcome of this research is valuable for architectural firms as it can help to assess and cope with ongoing and future transitions by enhancing knowledge-sharing behavior within the practice and making the company's business strategy more robust and adaptable. Secondly, it has value for the architectural department in academia, as the outcome of this research can stimulate knowledge-sharing behavior among young architects and give helpful tips on dealing with constant changes in the profession. Thirdly, the outcome is valuable for researchers in the built environment, as it bridges the gap between knowledge-sharing tactics and industry transitions within the scope of architectural practices.

3.8 Personal study targets
3 personal targets have been set up in this research. In order to make the objectives clear, those targets have been formulated by S.M.A.R.T (Doran, 1981), to have Specific/ Measurable/ Assignable/ Realistic/ Time-realted outcomes.

The first target is to learn how to carry out proper research (S), by learning from mentors, teachers, peers, and colleagues new software, procedures, skills, and knowledge (M) and applying those myself (A) along this Master thesis (R) within 1 academic year (T) and later on in further career development.

The second target is to stay effective, and efficient throughout the whole process (S), by tracking the progress, planning and maintaining the schedule, focusing on study/life balance in order to have enough mental and physical resources (M), and checking the progress of the research with mentors and peers through meetings and self-reflection sessions (A) along the whole research within 1 academic year (T).

The third target is to challenge a personal introverted character with opportunities for social interaction (S) by studying the theoretical part and applying new knowledge in a large organization through learning company culture, processes, and ethics (M) and stimulation of deep personal understanding of company projects and processes (A) by becoming a member of office community (R) during this academic year (T).

FINDINGS

FINDINGS

This chapter aims to provide the practical outcome for this study, based on the empirical single case study, by answering RQ1, RQ2, and RQ3 through the information gathered from the primary data. It is based on the analysis of 20 interviews with 16 people from KAAN Architecten and the observation diaries of the researcher.

4.1 Methods of analysis
4.1.1 Empirical research content and questions
The chapter on findings is systematically organized around the original framework proposed at the beginning of this study, which consists of three components: *'ongoing transitions,' 'knowledge-sharing,'* and *'knowledge-sharing tactics to cope with transitions.'* These components have been consistently applied throughout the research, starting with the structure of the interview questions and the organization of observation notes. Accordingly, the interview protocol (Appendix A) is arranged to align with these three key components. Although the sequence of the questions was flexible to allow for adaptability during the interviews, the overall scope was predefined. In order to protect the research participants, the pseudonymization technique has been applied. Therefore, in the empirical research, quotes from participants will be indicated as 'Interviewee N', without specifying their roles in the company to prevent the disclosure of their identities.

4.1.2 Empirical research coding and analysis
The data analysis was performed using Atlas.TI, starting with a closed coding process. Initially, several groups of codes were created (as listed in Appendix E), including *'transitions,'* which categorized the major types of transitions observed in the research. This category was subdivided into *'external'* and *'internal'* to clarify the nature of the changes observed; *'interactions,'* adapted from the modified version of the knowledge diamond from the theoretical review; *'participant outcome,' identifying the involved actors;* 'enhancement tactics,' derived from the literature review; 'levels,' indicating the subunits of analysis; and *'knowledge type,'* distinguishing between *'tacit'* and *'explicit'* knowledge.

Open coding presented a challenge in categorizing the gathered information into three main areas: *'methods,'* which are strategies the company used to manage transitions; *'obstacles,'* which hinder knowledge-sharing and transition processes; and *'triggers,'* which either accelerate or provoke these processes. *'people management practices'* were considered as potential drivers or opportunities within these processes. Additionally, *'knowledge-sharing tactics'* emerged as a distinct category during the data analysis phase, illustrating how specific actions, taken by the research participants to cope with transitions through knowledge sharing, evolve over the course of the research. It became apparent that triggers for certain events could serve as opportunities or obstacles for others, leading to the creation of a *'paradoxes'* code to highlight these unique characteristics.

4.1.3 Empirical research chapter structure
This chapter is organized as follows. First, the results of archival research will be presented, introducing the case study, the organizational model of KAAN Architecten, and the key documents that were analyzed. Secondly, the answer to RQ1 will be given based on the gathered data, and the identified transitional processes will be further analyzed in RQ2 through the perspective of knowledge sharing. Furthermore, for RQ3, the knowledge-sharing coping tactics (KSCT) will be extracted from the empirical data, and through the analysis of the aforementioned transitional processes, the specific KSCT and their tactics will be outlined.

4.2 Case studies introduction
4.2.1 Case studies introduction
KAAN Architecten stands as a paragon of modern architectural practice, skillfully balancing the dual demands of creativity and functionality across a global stage. Founded in 2014 by Kees Kaan, Vincent Panhuysen, and Dikkie Scipio, this Rotterdam-based firm has expanded its reach to international fronts with offices in São Paulo and Paris, thus emphasizing its adaptive and expansive operational philosophy. This introduction aims to dissect the mechanisms through which KAAN Architecten navigates transitions within the architectural field, emphasizing its integrated approach that spans across different scales and typologies—from urban planning to interior design.

The inception of KAAN Architecten marked a significant evolutionary step from its precursor, Claus en Kaan Architecten, which was co-led by Kees Kaan from 1988 until 2013. The transformation into KAAN Architecten not only signifies a rebranding but also a rethinking of architectural practice as a multidimensional and multi-disciplinary engagement. At its core, KAAN Architecten is not just a firm; it is a hub of intellectual exchange where theory and practice meet. Kees Kaan's role as a professor and his involvement in academic initiatives like the Complex Projects Chair at TU Delft underline the firm's commitment to intertwining academic research with practical architectural solutions.

The firm's philosophy is deeply rooted in the belief in cross-pollination between projects and disciplines. This approach is critical to fostering a dynamic environment where critical debate is encouraged, enhancing the creative process and ensuring responsive and innovative design solutions. This culture of ongoing learning and adaptation is crucial in an era marked by rapid technological changes and shifting societal needs.

KAAN Architecten's project portfolio showcases a remarkable versatility, handling everything from intricate furniture designs to large-scale urban developments. This ability to operate across various scales is a testament to their comprehensive understanding of architecture's role in shaping environments and experiences. Their projects are not confined by traditional architectural typologies but instead seek to redefine the boundaries between space, function, and aesthetic value.

The international expansion of the firm with offices in São Paulo in 2015 and Paris in 2019, led by Renata Gilio and Marylène Gallon respectively, reflects a strategic adaptation to global trends and local contexts. These branches are not mere extensions but integral parts of the firm, upholding the multidisciplinary approach and fostering long-term relationships with clients, consultants, and partners. This global yet localized approach enables KAAN Architecten to engage deeply with the cultural and environmental specifics of each project, enriching their design solutions.

Moreover, the firm's office itself, housed in a transformed building in Rotterdam, encapsulates their philosophy. The office, known as 'De Bank', represents more than a physical space—it is a manifestation of the firm's values and vision. By revitalizing a heritage site, KAAN Architecten demonstrates how spaces can adapt over time, respecting historical contexts while serving contemporary needs.

KAAN Architecten exemplifies a forward-thinking architectural practice that embraces change, engages with a global context, and remains deeply intertwined with academic research and practical application. The firm's ability to navigate transitions within the architectural field through a multidisciplinary and culturally sensitive approach not only sets a benchmark for contemporary architectural practice but also contributes significantly to the discourse on sustainable and responsive design strategies. This case study will further explore how these strategies are implemented within KAAN Architecten, shedding light on the firm's transformative journey and its implications for the future of architecture.

4.2.2 Orgazniational Structure
Since 2021, the organizational structure at KAAN has been noticeably adjusted by restructuring the core of the company in terms of responsibilities and management (KAAN Architecten, 2022a). Originally, KAAN Architecten had a typical architectural office structure, with core responsibilities and management held by founding partners (Figure 19). Seeking organizational optimization, the positions of Managing Architects (MA) and the Management Team (MT) have been introduced, enabling them to take charge of overall project planning, IT support, expertise on local Dutch policies and regulations, and HR (Figure 20). The subsequent introduction of the Managing Director (MD) position was intended to unify the Founding Partners, Managing Architects, and other firm departments (Figure 21).
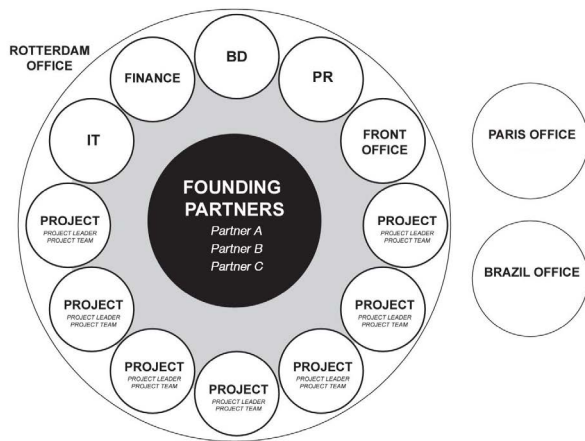
Figure 19.
KAAN office structure original
(Source: KAAN Architecten)
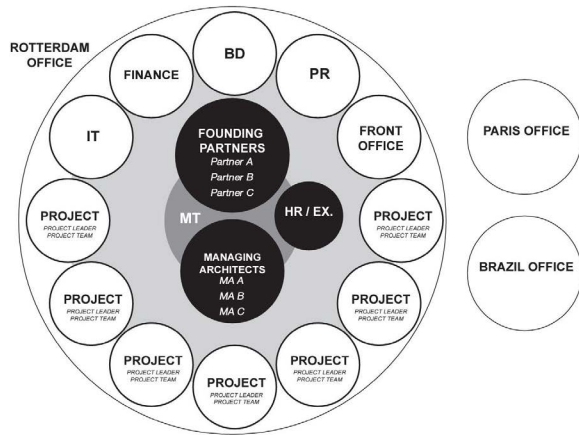
Figure 20.
KAAN office structure , MA introduction
(Source: KAAN Architecten)
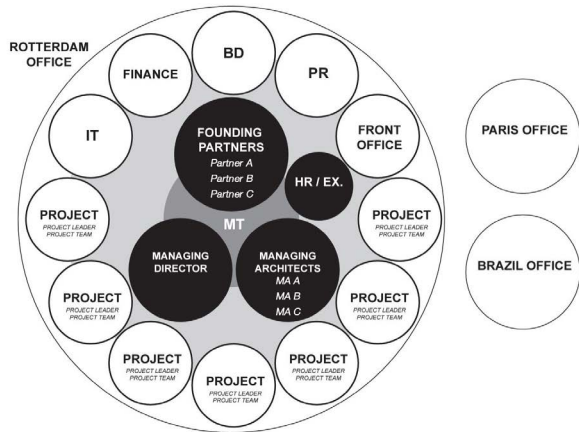
Figure 21.
KAAN office structure , MD introduction
(Source: KAAN Architecten)

Organizational Department Structure:

Currently, the Founding Partners in KAAN Architecten retain actual responsibility for PR, BD, and finance, and they only oversee and support the progress of ongoing projects. MAs and the MD collaborate and participate in every department of the practice; for example, the MD works closely with BD, finance, and the front office, while MAs independently manage HR, IT, and project planning. The relationship between the parties is depicted in Figure 22 (Interviewee 1).
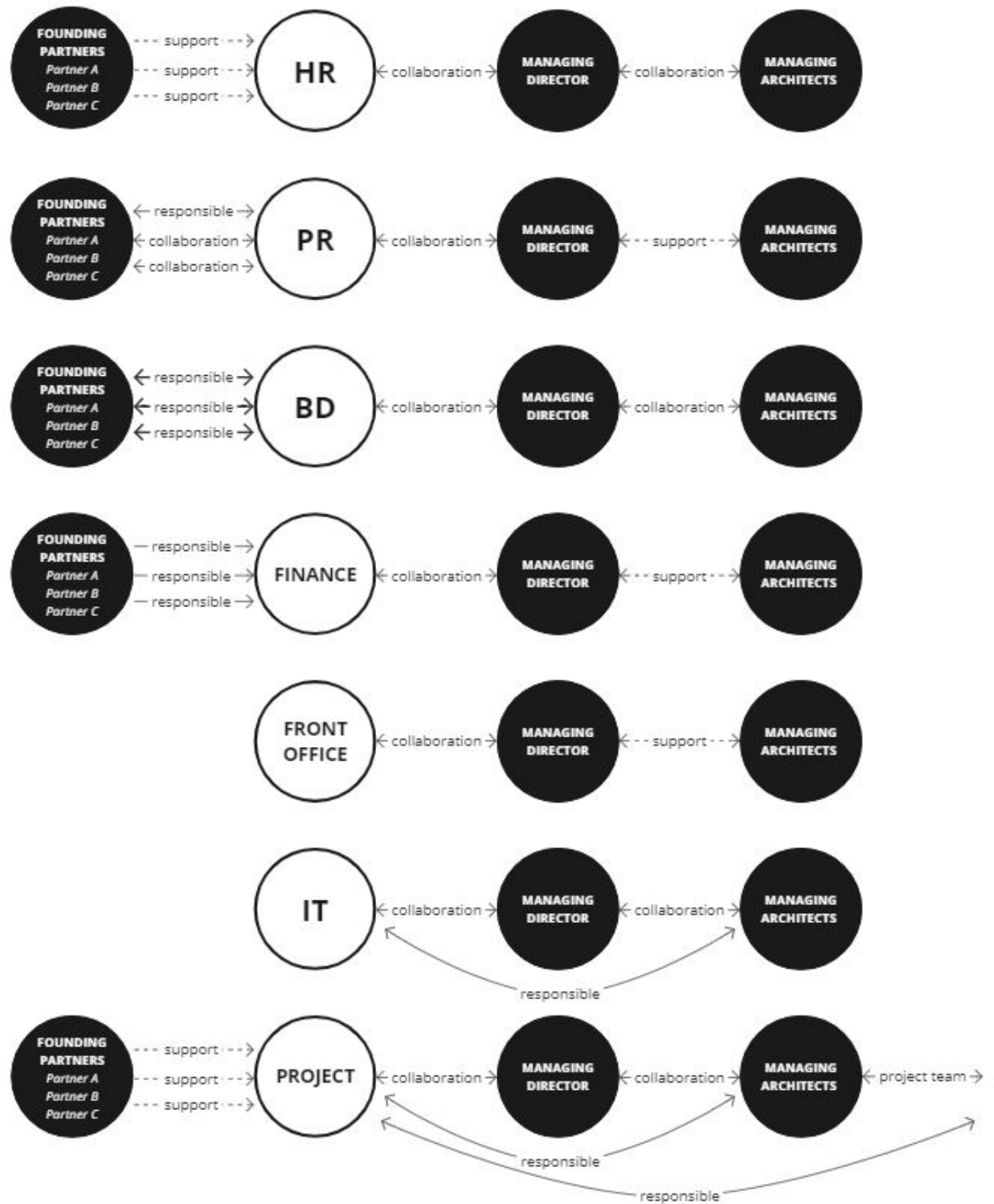
Figure 22.
KAAN office structure , responsibilities by
the department
Source: by author

Project Bubbles:

At KAAN, projects are central; hence, they serve as the engine of the practice. The recent change has also modified how project teams are organized. Previously, there was a flexible *"pool"* with fixed team leaders where randomly available people could be assigned to a new competition. Currently, however, the system of team *"bubbles"* has been implemented, with a fixed group of people within a bubble. These bubbles are overlapping, meaning certain individuals can belong to several bubbles and multiple projects. This approach allows individuals to remain engaged in long-term projects and have opportunities to challenge their skills and responsibilities in short-term projects. Depending on the size, duration, and challenge of the project, the project team is formed. The primary responsibility for a project's success is distributed between the Managing Director, Managing Architect, and Project Architect. It is not necessary for all three to be involved in every project; involvement also depends on the project's initial parameters. The size of the project team varies, from 3-4 people for competitions to a large interdisciplinary team, including consultant co-location. The generic structure of the *'project bubble'* is visualized in Figure 23.

The *'project bubble'* structure was proposed as an alternative approach to forming project teams (Interviewee 3, Interviewee 1, Interviewee 4, Interviewee 5), allowing for a flexible solution and a good diversity and balance of employee skills to create new project teams while staying within a particular design methodology and being led by one of the MTs. This solution helps to avoid additional turbulence and adaptation time needed if project teams were formed from the overall pool of employees across the entire company. Thus, every project bubble includes experienced employees specialized in earlier or later project stages, hence more conceptual or detail-oriented thinking, as well as more design or technology-oriented individuals (Interviewee 1). The level of experience correlates with the level of management per person, where more experienced employees communicate ideas internally and externally, while less experienced employees are in charge of design production. This approach also allows employees to set clear career growth paths and choose specializations they are eager to master (Interviewee 2). Although the project bubbles are quite fixed, the most senior employees, with advanced technical knowledge, are flexible enough to migrate between the bubbles to help further develop the projects (Interviewee 3).
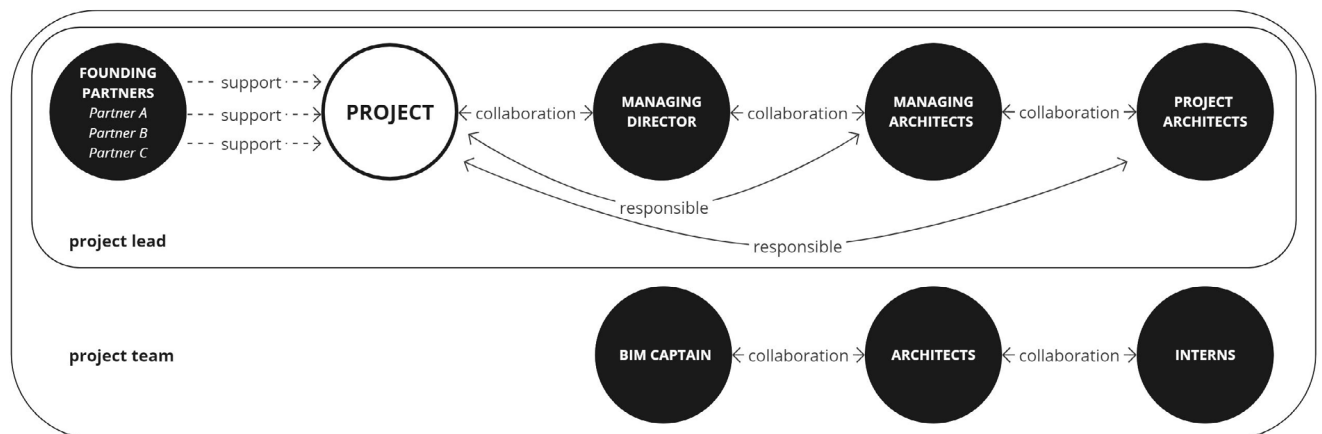
Figure 23.
KAAN office structure , 'project bubble'
structure
Source: by author

BIM Team

In response to the requirement of DB and DBFMO contracts to submit a BIM model, KAAN proposed organizing a BIM knowledge hub within the organizational structure by hiring architects who also specialized in BIM. This team helps other colleagues resolve issues, maintain a clear model structure, and ensure project team compliance with contract requirements (Interviewee 11, Interviewee 13, Interviewee 12).
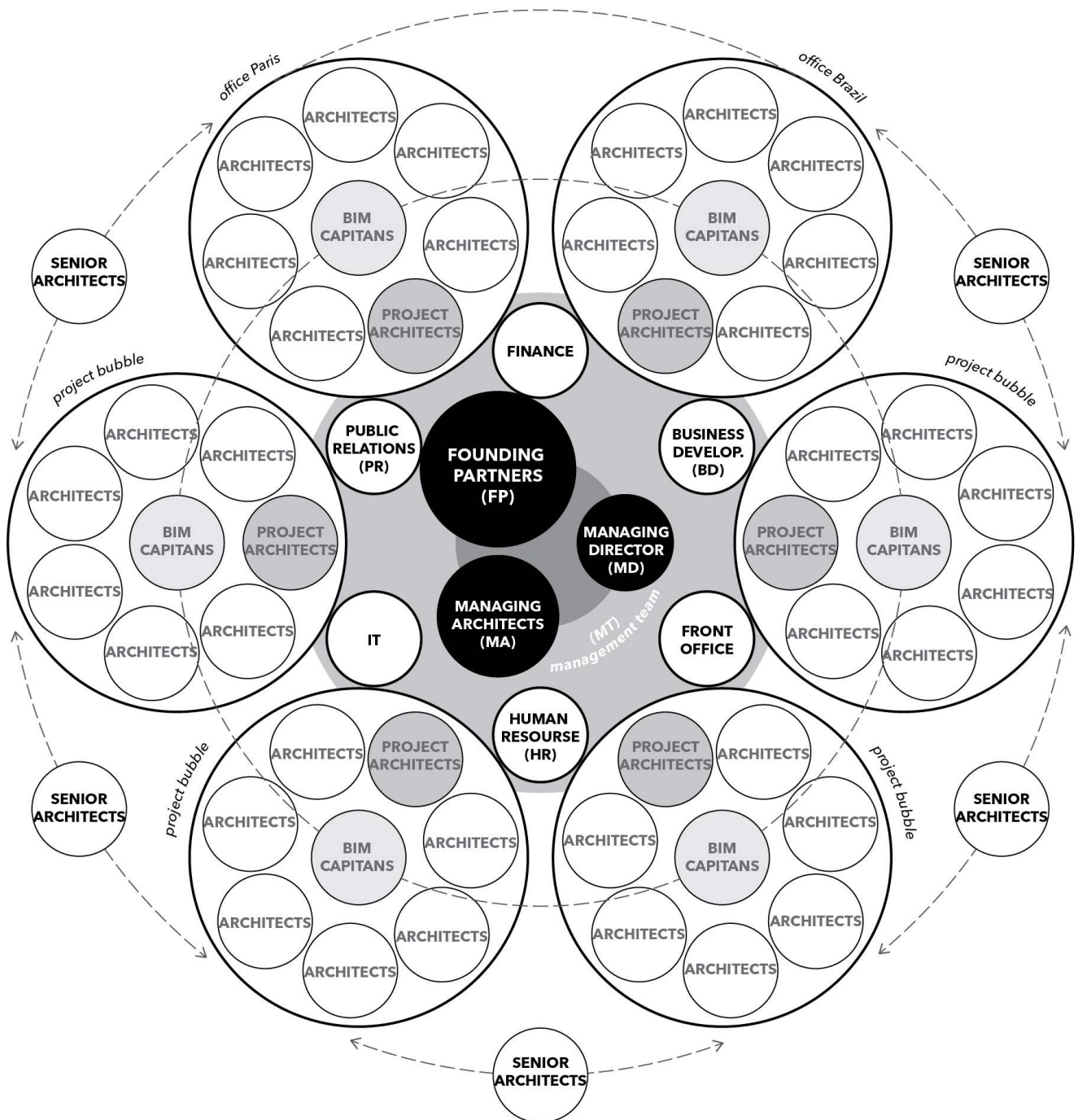
Figure 24.
KAAN organizational structure
Source: by author (based on empirical data)

Thus, the current KAAN Architecten organizational structure forms a *"universe" model*, where the project bubbles and other departments orbit around the core of partners and MT, forming additional orbits for BIM captains and senior technical employees (Interviewee 3) (Figure 24).

4.2.3 Key Documents
impaKt

KAAN has developed *impaKt*, a value-based design methodology with the primary goal of raising awareness about the consequences of each design choice among the project's design team and clients. KAAN aims to make each choice's multiple interwoven aspects measurable and graphically understandable. impaKt aligns with KAAN Architecten's design vision, which places the users and community at the heart of each design decision. While the demand for available space has significantly increased in recent decades, we acknowledge an increasingly pressing environmental ceiling, driving the need for clean, low-demand, environmentally friendly, and nature-inclusive buildings. (KAAN Architecten, 2023a)

triggers: to reflect on ongoing sustainable transitions happening in the world, EU sustainable goals, to create office products, connection to existing academic and industry knowledge (labels, classifications), to use it as a communication tool with clients to address sustainability demand (Interviewee 2, Interviewee 5)

development: during COVID years, top-down, first spontaneous discussions, then weekly sessions, then development together with people, who have time, then several building blocks. From meeting notes to the principals and then to design principles, applied to project analysis (Interviewee 2, Interviewee 5)

obstacles: to make the parameters measurable, not every project bubble is using impact in their approaches

knowledge sharing: several key people in the office believe in it and promote it (Interviewee 2)

Optioneering

Working with high-complexity buildings, such as Schiphol Terminal, options evaluations are essential. That's why KAAN Architecten has has developed *'Optioneering'* tool, it is an *"approach that is responsive to ambitions, translated into functional requirements and driven by data"* (KAAN Architecten, 2023a), which is based on 4 primary components: data, requirements, design options, and evaluation. Identifying different design topics is the first step of Optioneering, their outcome is the best-substantiated design decision, while design decisions will create new design topics to study. Finally, multiple related design options can be combined into one integral design decision. Optioneering is based on formula *"value management = value engineering + value analysis"* (KAAN Architecten, 2023d).

triggers: to document internal know-how methods to deal with project complexity by specific steps. The goal is to develop several (3) most radical options, which correspond to project requirements, and use them as a communication tool between the architect and the actors involved. The method aims to help with prioritizing. The process is iterative throughout the project. Make it generic so that it can apply widely to different complex projects (Interviewee 14, Interviewee 10)

development: 1 specific person has been assigned to collect the information and prepare the booklet, which took around 1 year (Interviewee 15)

usage: The method helps to deal with complexity by dividing it into several (functional, geographical) parts. Sometimes Optioneering stems from the development of several options, but sometimes it is all the way around to challenge the main idea with the other options and compare if the original option is still preferable. Also used during workshops with other project actors. Optioneering is related to value-based design and helps rationally evaluate the options. Optioneering is also used within the office for instance as an approach to taking pictures of the built projects (Interviewee 6). Also applicable to small-scale projects. Optioneering is also used to give the client the desired flexibility to make adjustments without losing the key concept (Interviewee 4, Interviewee 10)

obstacles: people are familiar with the method, however beyond the project bubble people are not aware that this method has been documented. some employees believe that leads to development of extra options and challenges to project requirements or keeping the focus on short-term goals, without long-term vision (Interviewee 16). Understanding and experience is required to use the method, as it requires qualitative rather than quantitative approach (Interviewee 14, Interviewee 10)

knowledge sharing: the document has been shared by email to the whole office. The method is taught to the students at Complex Projects Studio. As Optioneering is one of the several project approaches in the office, people from the other project bubbles need adaptation time to use it properly. (Interviewee 15)

Competition handbook & Design brief template

"In the past few years, the office has participated in many architectural design competitions. In order to improve efficiency and coherency in the production of future competitions. This research defines one (of many) possible ways (s) to structure the process. It aims to reduce time spent on producing and to start a discussion on how to work smarter" (KAAN Architecten, 2023c). The Competition design process is the continuous iterations between project thinking and narrative, where the making process lies in between. Making has 3 stages: Design research, Design Process, and design Finalization. The competition handbook describes each of these steps in a separate chapter. The first *"The KAAN design brief'* provides *"a clear and comparable structure to the competition research & analyses".* The second one *'KAAN design studies'* optimizes *"the design process with clear principles for generating design options (also referred to as Optioneering)".* The third one *'KAAN final production'* provides *"a framework for a high-quality submission and at the same time develops each project true the making of these"* ((Interviewee 15).

triggers: to document the essential knowledge for the process of competition and the expected outcome to guarantee the quality, to make a document for project brainstorming and essential analysis. (Interviewee 12)

development: took around 4 months (competition handbook), has been done along the development of one of the project design briefs (KAAN Architecten, 2023c) (Interviewee 15)

usage: used in the office as a reference guide-line for the competitions

Building Narrative

A working method, which correlates with diagrams method, Optioneering, Competition handbook, and Design brief, which helps to focus on the key questions. Based on a pragmatic, rational approach to deal with constantly growing project complexity. Building a narrative is an artifact in process, as the work on the book is currently under development.

motivations: keep focus along the project internally and externally

usage: has been used by one of the bubbles to develop weekly presentation updates, that can be evaluated. The building narrative method is also used to create various angles on project descriptions for business development purposes (Interviewee 6).

knowledge sharing: building narrative is taught at Studio of Complex projects along with Optioneering.

4.3 RQ1. Transitions

This chapter provides an answer, based on the practical findings and a theoretical framework drawn in section 2.3 on RQ 1: What are the **ongoing transitions** experienced by architectural practices?

The chapter is structured as follows: It begins with an overview of the transitions, organized by triggers, examples, obstacles, and opportunities for each transition. It then elaborates on the interconnections between different transitions by analyzing their influence on each other and identifying the particular transitional processes that characterized the case study. Lastly, the chapter outlines the hypotheses and overarching insights regarding transitions. Table 8 outlines the primary codes that were used for the analysis.

Code	Code	Code	Code
● TRANSITIONS EXTERNAL	● METHODS	● TRIGGERS	● ENHANCEMENT TACTICS
● T_E_economical	● M_building narrative	● TR_collaboration	● ET_C_Coaching and Mentoring
● T_E_procedural	● M_diagramming	● TR_contract	● ET_C_Culture of caring (trust and cooperation)
● T_E_societal	● M_Impact	● TR_delegation	● ET_C_High band-width communication
● T_E_sustainable	● M_optioneering	● TR_education	● ET_C_Knowledge-sharing norms
● T_E_technological	● M_Structured thinking	● TR_flat hierarchy	● ET_C_Perceived support
● TRANSITIONS INTERNAL	● M_value-based design	● TR_giving freedom	● ET_PA_Developmental evaluations
● T_I_behavioral	● OBSTACLES	● TR_identity	● ET_PA_Reward knowledge-sharing behaviours
● T_I_design approach	● O_appearence oriented	● TR_long term vision	● ET_PA_Summary Reports
● T_I_organizational	● O_bias	● TR_micromanage	● ET_PS Space for face-to-face communication
● T_I_sustainable	● O_Bureaucracy	● TR_prioritizing	● ET_PS_online communication
● T_I_technological	● O_communication issuel	● TR_project	● ET_PS_Talk Space
● LEVEL	● O_control	● TR_project complexity	● ET_S_Communication skills
● L_XL_interorganizational	● O_culture	● TR_risk management	● ET_S_Employee referrals
● L_L_organizational	● O_detail oriented	● TR_sharing work	● ET_S_Person – organization fit
● L_M_project-bubble	● O_generation	● TR_side activity	● ET_T_Intranet and E-Library
● L_S_project	● O_habits	● TR_specialization	● ET_T_Technology chosen to fit culture
● L_XS_personal	● O_HRM	● TR_studio_complex project	● ET_T_Technology to enhance existing social networks
● PARTICIPANTS OUTCOMES	● O_ignorance	● TR_team spirit	● ET_T_Training to use technology
● PO_Architects	● O_information sharing	● TR_time management	● ET_T_User-friendly information technology
● PO_BIM Managers	● O_isolation	● TR_transparency	● ET_TD_Departmental Meetings
● PO_business development	● O_limited experience	● TR_values	● ET_TD_Extensive training
● PO_client	● O_limited responsibility		● ET_TD_Formalized orientation and socialization programme
● PO_external stakeholders	● O_monotonous work		● ET_TD_Informal Knowledge Workshops
● PO_Management team	● O_pressure		● ET_TD_Knowledge Exchange Seminars
● PO_Project Designers	● O_talent migration		● ET_TD_Team-based/cross-training
	● O_technology adaptation		● ET_WD_Co-location
	● O_time management		● ET_WD_Communities of practice
			● ET_WD_Interdependency

Table 8.
Primary Atlas.TI codes for transitions
Source: by author

The following subsections are structured by transition. The information is organized in tables, which provide examples of items derived from the empirical research analysis, along with the triggers, obstacles, and opportunities for each feature. It's important to mention that all the featured items are case study-specific. The tables start with the external transitions (economic, procedural, and societal), followed by double-nature (external and internal) transitions (sustainable and technological), and finally, the internal transitions (organizational, behavioral, and project approach) (Tables 9-15). The name of the feature in bold italics refers to the Atlas.TI code, while the further description is a quote from the interview participants. The quotes are selected based on the most prominent items that appeared in the interviews; triggers and opportunities are also selected based on frequency, while the supportive quotes are chosen to highlight diverse opinions on the topic. Data on the frequency of mentioned items is collected in Appendix F, capturing how many times interview participants referred to specific codes.

4.3.1 Economical External Transition

Economic Transition		Example Triggers	Obstacles	Opportunities
	focus on circularity, values shift			
	integrated contract			
	market demand	**global events, office ambition** *There was not really social housing in the neighbors with the Haag and the smaller cities. That's what we did. Like a lot of work and we managed to do that. In a very efficient way with a very simple concept, there was one element in the project that made it specific and we pushed them to the full, and that made the design always very recognizable. Typically Claus & Kaan back then, you see the development of the office especially going forth, to the crisis that on the right time the office managed to include more complex projects for more diversity in the portfolio with municipal projects like a museum or courthouse, the kind of diversity was very important to actually survive the crisis because in the crisis the housing market was affected, most of the commercial real estate. We needed as an office to continue because of different projects like university buildings and that is now basically I think the basis of our office we have such a diverse portfolio and we can do anything from a villa to a courthouse to a terminal. I3*	**place specific** *Sometimes it's difficult to get insurance because we are foreign in their country or it's urban planning and we are a little bit nervous about being the lead. Because it's a very long process and a lot can go wrong. Or the program is too specific. I2* **reputation, previous experience** *I would say in the commercial market, where the housing and offices work, private clients still very often have the freedom to select an architect. But then sometimes they have to tenter. So that means the developer tenders against other developers. To get the development right for a certain plot they select their architect very often based on the idea that with that architect they can win because that architect has a good reputation with the municipality or with the supervisor or whatever, so they choose the architect based on their the best to win tender. I1*	**diversification, balancing** *For the acquired projects and for the billable projects we have some rules of thumb about, what is the hourly fee which we can spend on a project. So we have a certain amount that we can invoice and that amount we divide for a certain number and that gives more or less the size of the team. And then, of course, we mirror it. Sometimes I mean that it is not black and white in the sense that there are some projects in which you have to invest because you know it will bring something back or something more. And there are some other projects which you know, maybe it's the 4th of the fifth of the same kind which you do in a row and then you know that you can reuse a lot of things which were in use before. I5* **collaboration, long-term vision** *That is really strategic. I go to these trade shows all the time... When you go to this and also advance, you talk to people about what's gonna happen this year. BD keeps track and everything that is posted... and then BD tells me, OK, try to figure out what is this this and this. So then I start making calls or I go to the dance. And the people you talk the most with are your partners. So there are engineers or possible local artists, but you also talk to politicians and people. They're working in the city. And when you do this long enough, people call you. So they say: Are you in the team already?... We have a constant list of which competitions are gonna come there we heard about and normally for those we already have a team. I2* **risk-management, prioritizing** *there are some things important when I get the contracts, it's very important to check the scope of work. Is there anything else? Deadlines. On the right terms, of course, but also copyrights in penalties. You have to be very careful because sometimes there are some things that are reasonable in the country. They didn't. You pick your fights. I2*

4.3.2 Procedural External Transition

Procedural Transition	Example Triggers	Obstacles	Opportunities
Optioneering / Kick-off guideline / competition guideline	**project complexity** — every product is now more complex and organized smaller and has a different platform…Technically speaking, it's a Google Docs, or more developed because when you click and fill in, but then it also gives you an answer that impacts some other requirement or not because they're linked. I4	**communication issues, project approach** — But I think there are also a lot of people within the office and working on other projects who have a bit less optioneering or use their variant of it. I mean there we I think also sometimes optioneering could seem a bit overdone in the sense I gave 20 different options in a row can be slightly intimidating for people. I12 **short-term vision, time management** — That happens also and a lot of times here people don't have a long overseeing of the problems. In the the project maybe yes, but sometimes maybe I'm wrong, but this is how I see: Ohh I'd have to give you, I have to produce something. But what for? What is the need for this? You have to give yourself a lot of time to think and then you produce. If you start doing without it, it's a waste of time. I16	**flexibility, collaboration, identity** — Because the issue is that you give them a fantastic design and that's of course I think that happens if you do some very particular architecture and it can be amazing, but it completely falls apart as soon as someone pulls one of the threads and maybe the advantage of the fact that KAAN architecture is quite simple and has a certain level of repetition. It also means that you can change it without losing the main concept. So I think it's also smart for us to change it if that way maybe that's our version of sustainability and communication with the client. That's like a plug-and-play thing that can help us in further workshops and negotiations with the client later on. I think we should try to sell it like that. I10 **knowledge base, artifacts** — That was the idea was to make three books. One was the competition catalog. One was the optioneering and one was the design brief that everybody could use in their projects. I15
tenders	**values shift** — The tenders are usually public clients. And that would be more tax money. So there would be more social. If it there should be a ratio with how the money is spent. And that has a meaning for society. But if you have a private planet, it could be completely different, because probably they will find other things in a project much more important and maybe not even interested in being as seeing it as a public thing, for example. And it has other rules. I6 **project complexity** — System engineering case is the engineering of requirements and became signs on its own and that's that each project, for example, projects A and B has it crazy complex that you have a system of requirements that are like an excel sheet on platforms. And then you have different levels of the requirements. For example, top requirements, from the building needs to be beautiful, and sustainable, to have so many square meters for this room, the climate in this room needs to be like this and that, in this room, you need to have so many sockets. I4	**place specific** — There are all kinds of different contractual forms related to that. Internationally, also so in the Netherlands, it's different than in other countries. Well, it's different in many different countries. It is different, but let's say we have to, you have UJA as contract forms and the DNR. So we have several contract forms that relate to several ways of arriving at a project, international as FIDIC which has different versions, but it doesn't match very well with the Dutch way of tendering, especially towards subcontractors. So it's, let's say it's very complex. I1 **specialization, market demand** — Another thing is that the demands are so specific that you need to show other architects for parts. We did one entry a few weeks ago with [a firm] and it was possible that fitted precisely we got a 100% score. I6	**integrated contracts, risk management, client involvement** — We see a lot of design and build structures, so that means that you tender already together with it a builder and for a project. So from day one, you are in a team with the contractor and with the engineers etcetera. Yeah, I think that is becoming more and more let's say the situation in commercial and non-commercial public situations also because the client public client wants to limit the risk of having a failure when they turn on the design to find the call to find a builder for their project. I1 **office ambition for projects** — Normally we don't choose for respective concept we choose a project and we adapt to the contract that is behind it. We never choose the contracts. That's the key element. We see a project and we say we want to do this project and whatever the contract is, we try to adapt. I5
collaboration	**project conditions, ambition** — Each project has a question and the question is how it can be programmed to build something. Sometimes the client knows exactly what they want in a very precise way, and where they want it and sometimes it's less clear, so that are different starting points. That resulted in different kinds of projects and that is one thing. The other thing is a project context which is defined by how is the client organized. All kinds of people are working there. How they are or do they want to organize the project? Are we collaborating with other engineers or not? How the tender is organized and in what kind of contractual form is all of this situated? All these project contexts or project environment and they're not even interested in the way it's built environment, the environment and more in a way like you talk about the setting of the work that has a big impact on how we design and how we approach it and also how we build our team in the project. I1	**role of the architect** — I mean in terms of working out the theme, what you should understand, architects are more expensive than contractors. So if it's about making drawings, they need to be designed in general, as the architects, we are more expensive. So a client of commercial client doesn't have the interest of letting us work as far as possible. They have an interest in getting the contractor on board as soon as possible because they can end the tune us down in finding solutions which is probably less expensive appealing and and they want to organize the us down…In the past, we were managing much more easily to get full design assignments, so including construction-ready design in Dutch commercial projects now is almost impossible. It's very, very difficult. I5 **design limitation, risk management** — If you bring in the contractor earlier, so the contractor becomes part of your design team. They [client] used that very often to de-risk the project. So you get it's more difficult to do very let's say experimental innovative things, partly. And it's always, it's always difficult. I1 **bureaucracy, market demands, policies** — The more you have this overall hierarchy, the more you have people in the chain who take margins because they take risks. So if you kill the intermediate, you have a cheaper building. But that's not something easy to do because you have to be within the law and at the same time try to push the market towards the way you want them to go. I2	**communities of practice, internal connection** — We'll see how we heard about this [possible project].. For this form with the list BD that is always up to date. OK, when the tender is published and is public, then BD is the main coordinator and there's many people that work on it. Depending on the project that can be MT, Brazilian, or French office, can be a combination. Sometimes you ask a project leader to write the text. And when that's already the official. And so was the submission done. Then MT takes this over. So the vision is submitted for this airport. We are going hear in three months, then we are not selected. If you're selected, then it's a competition. I2 **fulfill the ambition, technological advancements** — Simultaneously I would say that new technologies with BIM and everything also supported that [integrated contract type]. So it became easier and better possible to do an integrated design. So it sort of coincides that you could say and led to very good results. I1

4.3.3 Societal External Transition

Societal Transition	project approach	focus on circularity	organizational and individual ambitions
Example Triggers	**project complexity** I will not forget the way that we built diagrams back in the days like 2005 was very often sort of sequence of this plus this is this. And then there was basically if you put that on the screen that everybody understood the project and it's very simple, this plus this is this. Now we see that there are more factors involved and we see that there are multiple diagrams now often necessary to explain the project. But the interesting thing is that also society, humanity can understand more complexity and in 20 years we have involved you a lot and even the level of how we can deal with information. I3 **inclusivity** Now there have been many developments in society in Holland that have to do with an imbalance between the establishment and the young, so and minorities like women, and the disabled. These developments influence us. For example, that's one of the reasons why our female colleague presented project A. I6	**values shift, focus on circularity** Maybe a third thing is the development of sustainability. I6	**role of the architect** It also changed 30 years ago, let's say, we didn't do it [collaboration]. It was all it was, a bit of the time of this 'start architects'. We thought we could do it ourselves. We don't need another. I think there are two changes. One is that society changed completely. The years of Star Architecture are over. I6
Obstacles	**place specific** When you do a project in Amsterdam, it would be a bit different than some provincial. Because we as KAAN are usually, I have the impression that we are too overwhelming for small municipalities. For example, we rarely win anything there. We are maybe not cozy enough, not normal enough, not I wouldn't say mediocre, but in Holland, when you another, at least when you rise above the average, it's not necessarily a good thing. So when I go to [remote province] and I show the courthouse. It's pretty useless. It's scary for them. Well, the bottom line is, if you try to understand your clients and try to read between the lines, you can start to imagine what things are important and what kind of preferences are important. I6 **limited experience, risk management** So this is the discussion in Holland because there are two things. One is that: it changed when we won project A...it was not based on experience, but on the intellectual value that you present. And the strength of your story and now it's for a very large part, risk-driven. So you have to prove to a large extent all the things that the client wants that you've done before and within a limited period. And then leads to the second point that young architects, young officers, are frustrated...that now you have to prove that you've done it before yourself, that you have a hard time getting in. I6 **generational conflict, technology-oriented** The ritual process, the workflow process is disappearing. Because you're outsourcing your brain. So this is what I guess seniors and elder people are most scared about. We are part of the transition. We are literally in the transition generation. Which has been dealing with these thoughts I was born without a phone, without a computer, and now I have all the technology. So we are nonnative digitals. People with 20 years old right now, are native digitals. They were born with phones. They were born with computers. We know what it's like to dial with these old phones, so this is what I mean. Everything we know. Everything was a ritual back then everything was probably sticking, but then you use your brain, because everything was done by hand or everything required and specific steps process. I11	**limited experience** We were relatively late in implementing. We had this vision that sustainability is something intrinsic in that should be intrinsic in architecture, not a way to express yourself. So the architects that have designed buildings that express sustainability, or circularity, or we never chose for that for a long time and making it harder to show your project as being sustainable. And then sustainability is also seen usually as a thing about energy, materials, and technology. Well, it's also about quality or sustainability in time. When you make a good building, yes, flexible, but all these aspects are not relevant, if you want to prove that you're building is sustainable which connects to the strictness of the requirements. So we are catching up, but that weakened us a bit. I6	**conflict of cultures and generations** They [partners] are sort of the boomers. They had to build this country, so they worked for it. Like China. Then you have their children, and I'm a bit in the middle. But the children, have their bedspread. This is a generic story. Not necessarily 100% true and that's not judging. They also have different values in life, like social interaction or family or developed your interests are in the other way than my work. And the willingness to put all this energy into an office or in a different priority. I6
Opportunities	**new skills, technological advancement, digital tools** It is interesting though that for example, my kid who's 6 almost seven years old, also watches images or videos, at school, they learn already to identify if something is real or fake. So, they learn there is a difference between you and me sitting at the table. And you see a video of somebody, this fast stuff that this person would never say for his own in it's working, the politician says, something that he would never say. And that this is AI-generated or manipulated so we have to learn as children already that there's been a difference between physical and digital. I3	**impact, project approach, value-based design** We try to develop starting from the 12th principle which an architecture design should follow to be qualitative and sustainable. But I just see how those principles translate into practices applied to this specific project. And then I remember with the project, we came up to a sort of roll out of the principles into practices, and then from the practices we said, what are the drivers that the project should follow? I5	**work-life balance** I think it matters what you find important in life. For me, my job is not described, but I owe my job. And that's important to me. For another, it might be only part of that. You can call me anytime for my work. It's fine by me. To a certain extent maybe. But if I'm needed, I'm there. That's how I want to live and that's how also my photography and that's how I give meaning to my life and family of course. And then if you find other things than work more important than you know, you have different attitudes and different ownership of your work. But this it's of course, not completely true. There are different cultures here and different backgrounds, but I'm speaking from the way I experience it as a Dutch person in this company. And I think there was much more of work before. I6

4.3.4 Sustainable Internal/External Transition

Table 12
Sustainable Internal/External Transition
Source: by author (based on empirical data)

Sustainable Transition		
impaKt **Building Block Guests** **Collaboration with academia**		
Example Triggers	**Obstacles**	**Opportunities**
focus on circularity, global events, market demands [external] So this was I think, a cultural shift in the European Union in the sense of vision, that's ambitions. Was there already after the Paris UN agenda? But it's sort of things have to go and sustainability is often a part of it. It could be a decision for the client. Let's say we want the BREEAM level but not the label. And then we [architects] don't have a label. I5	**certification** The usual system is that there is competition, there is a promise or a label. And then we [architects] don't have a label. I5 **measureability** Look, you could say that impaKt is a tool that we have developed for our understanding. So in principle, it's a tool that we use to reflect on our design work. Several criteria are developed within that let's say the wheel of aspects that are relevant for sustainability or in general the building quality or sustainability. What we have never been able to do up to now is to make those criteria measurable. I5	**shared values** I think impaKt, for example, could help the people, to the architects that are going to meetings and it could help to make them aware of reports of this and in this building block, I also want to say you have a position in the future of this by believing in that these kind of things are important for the future of this project and also for environmental reasons. I6
office ambition, increase awareness, value-based design [internal] we started understanding, you know, which are sustainability labels we use, which are the theories that are being talked about. There are dependencies in the market, you know, so this big shift into understanding the social aspects is important. But also carbon counting and implementing the full carbon life-cycle counting, the taxonomy. I2	**communication issues, limited experience, measurability** It's now very and a real change is that I think for example the impaKt and the carbon things. It's very difficult. So I think the office in general, it's a difficult office to really talk about sustainability and then I think would be behind on this; I think we find it quite hard to, I couldn't really pinpoint why. I'm doing now a competition and they are also asking for some very sustainable buildings. Everything needs to be like, perfectly sustained... I'm lacking the tools to respond. I don't, and I sometimes don't know where to start... I wanna know what tools we have and now we have impaKt. But now for me, that's not the tool. It's still a presentation. I8	**communities of practice** So we did those booklets and we started bringing them to the trade shows and slowly people understood more and more. It's not perfect, so I would say 60% of the office thinks like this and tries to apply, but it's OK. Everything is a process, you just roll with it and try to improve a bit of it. I2 **specialization** I think the only way to really make this better is to have way more than spend way more time on this topic to really have someone who is chief sustainability and who goes to events or knows all the literature. I8

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4.3.5 Technological Internal/External Transition

Technological Transition	Digital tools and AI	from CAD to BIM
Example Triggers	**technological advancements** Before we had someone modeling hundred options. Now AI will just throw it out and you can already see which direction we want, because at the end it's about the image and final result. So yeah, you will see an image which direction to take and which direction is totally not feeling right. That is how AI could help us. I13	**integrated contract type, collaboration** Through the process requirements are not really defined in the software, it's mostly in the contract, but that's the end story. During a design phase collaboration is motivating the need to use Revit. I13 **role of the architect, collaboration** If you check one of the projects of 15 years coming to 10 years ago, everything was pretty much drawn in CAD, and drawing CAD means everything. So a structural engineer didn't even exist. It was just an entity that was providing feedback like, I would do 20 by 20 columns and then it was the architect that was implementing the columns on the CAD file. Right now you are also empowering the structural engineers and advising them by saying guys you need to deliver something in 3D so that we can coordinate and we can print it out. So therefore, to establish these agreements between the different parties, that's why I would say this role started to gain more and more momentum. I11
Obstacles	**custom dataset, bias** We have chat GPT. Good. Beautiful. It's helping a lot, but maybe the designers, and architecture have to start taking a step further by building their language models. Same as you would be doing with that image generation model, you have your image generation tool which is mid-journey whatever you wanna do. Good, but the images are super generic. I11 **detail-oriented, project identity** There was the presentation of KAAN projects from last year and we were doing this Project D...and we had an AI-generated image. And of course, that image was generated by KAAN, we did a lot of input because we input parameters sketches and first start of starting images. And what came out was really KAAN but when you look good you see that it's not really KAAN because stuff is not right. So, I mean there's this thing that we think, OK, you see that behind you which there is no intelligence... We always make it flush and actually, we would never make the material that material on that place because that doesn't make sense. I was struggling a bit. I3 **abstraction, project identity** There's this trap that you can end up having their render or realistic image. It's even the project is at the vision stage. It's not like even the VOor sketch design. People start commenting on the like level of the details, and that's something that KAAN is of course, very famous for doing perfect details alignments and everything. But that's not the point. It's a vision. So it's and as it has already 70% of the identity of the KAAN it's good enough because once we start developing the project, we're just gonna like fix all the like alignments in details and like frames and whatever so. I7	**communication issues, technological resistance** I heard the other project leader said: OK, Fine, we will still do it in Revit. However, to match the outputs the more old school project leader expected it wasn't BIM anymore in the sense that it was all 2D stuff like a sticker over your over the 3D geometry behind it, and in that sense. Then you're sort of not making use of possibilities, and even I mean then you're working in a super compromised way which in the end makes it a way slower than it would have gone if you would have gone full BIM or full CAD or full Rhino. In this sense, you're in this sort of limbo in between which is not very beneficial for any of the all of the involved parties. You're not letting anybody or the software you know, use it in its strengths. I12 **limited experience, time management, technology-oriented** Although we had this BIM norm from the State Building agency and we had a person from the client side who was extremely precise if we did everything right or wrong, so. We didn't realize that until the whole BIM model was finished. So then after finishing the design and actually I think even after finishing the building almost, we had to work a lot on the BIM model to make it fit the requirements. And actually one of there were like three people doing that and one of the people got really overworked and really depressed. I9 **find the right moment** It's about finding the good moment when you transfer. Everything you have: plans sections and then ideas into the model and then from that moment on you just have to keep that as a single truth. I13
Opportunities	**connection to the university, collaboration** Everything comes to two things, collaboration, collaboration with academia it's crucial. There should be always a direct link between what's happening in academia and what are the actual market requirements. There's always this kind of this should be like a symbiotic approach where both are benefitting. That's for me, crucial. Collaboration with other disciplines. Outside the design environment. like software developers, and data scientists, the more we're transitioning towards that data-driven approach, the more we need to collaborate with these guys, and the more we need to understand their ways of working. I11 **technology to fit culture, shared files** We couldn't be doing things as we do from now without these things, without BIM and Enscape and live rendering was a changed profession, really a lot. Revit in terms of linking certain requirements, and having more control over processing the data in the requirements in the renders, changes things a lot. The development of IT changed things a lot. When we were doing Project C in 2017, computers couldn't handle things. We burned here server. Nowadays it goes easy and you know we have 20 people working on the same model. We have 10 people working on the same book in Indesign. We can do in one week 600 pages the report. Because it's it has structure is divided into parts and some of each person is doing something. Colors or every font is agreed upon. Starting sentences are agreed upon. Everybody's informed about the meeting in five days, so that's super good for coordination, more people working on, being, and so on. I4 **continuous learning, time management** from a profit perspective, having the space, and the room to train people and to give people the time to learn. And learn about working, making mistakes, and learning from mistakes. This is a bit of a problem, so considering the planning is important, there's a transition period for everyone, for everyone, and everything. The first time that you are faced with a different task that you never faced before, it's gonna take you a lot of time. The second time that you're doing it, it's gonna take you less. I11	**communities of practice** In project A, we did the full BIM project. But there we had a lot of professional experience helping us. So, we did that together with our collaborator B. Who're also the structural engineers and also the fire engineers, et cetera, but they also had a BIM team supporting us and we actually hired two people from collaborator B to put in our team to help with the BIM process. So we had quite a lot of gun power to set it up. I9 **personal ambition** I don't know, you have to stay in line with the transition. So I just had this one moment in my life, OK, Revit. OK, I have to learn it, otherwise I will stay behind and that's it. And then I just kind of push myself a bit and that's it. I7 **specialization, BIM team** If you compare that to 10 years ago, let's say projects are like more and more being developed using BIM technologies. And therefore there's like a niche...that's why the office started to see the urge to, let's say, train people into the kind of specialty. How to be very pretty much focused on delivering projects using BIM and building information modeling technologies. We are still architects. And I'm still an architect, but I'm mean, I'm not a very typical architect. I generate a little bit of architecture. I11

4.3.6 Organizational Internal Transition

Organizational Transition	Example Triggers	Obstacles	Opportunities
Project bubble	**flexibility** We wanted to go for the project bubble is more like a group of well-spread team members, who are flexible enough to do multiple projects within that bubble... and this is a way to make it easier to quickly adapt to change if anything has to be organized within the whole office all the time. I3	**Lack of human resource management, limited working experience, time management** I think we let [Person A] free quite a lot, maybe a bit too much, which meant that in the end things appeared a bit different on paper than how I would have liked them to have appeared. But it basically means that you have to sit together with the person and look at the drawing that they made and just talk about it and see what you would do differently or what is missing or what you know. I9 **communication issues, isolation** I really like to be part of something. Feeling you are like a lonely person doing your own things inside a big bubble... I wanna know all the different criteria that I'm doing my best. You know, I wanna make money for the office, or if we have free time. Or if I know that we're not making money with this project, I wanna know. For me, that really helps. I8 **daily challenges** It is a what is a daily challenge to keep the focus through. That is something that we have to be constantly aware of and get financially works well. It's not that each bubble has to be financially, self-supporting...in some cases you do more acquisition, and in some projects, you earn more money. I3 **balancing** A few years ago we were constantly throwing the whole office on one and a bunch. And then trying to organize everything that just didn't work because, in the end, you become too big. We thought that by making these bubbles or deals, you downscale the office a little bit and then you can spread knowledge equally and just naturally evolved means to be able to do a project from A-Z. So that means they have good designers, but they also have good draftsmen and technical people and good communication involved and only when one of the bubbles just suddenly has a project that needs others, then we relocate. Or when one of the bubbles suddenly misses out on the project or a project is put on hold we exchange. That is its concept, but it's not based on function, it's more based on simply, there are four managing architects, and bubbles to keep it a bit under control. I3	**specialization** Some of us are good at process, others of us are better at content and there's always a mix of it. And then of course there are other people in the project. Some are very good at analyzing requirements and programs and really doing the functionality of the project. While others are very good at materializing, so say not so much at organizing the plans but once that is there and there's the story and the narrative, they are very good at making it a building with beams and form and facades... And then there are also people in the office that are very good in very sharp and quick production of possibilities and diagrams and presentation stuff. Others are put at figuring out all the issues in relation to getting the permits so there are many aspects and there are many people and then there are people that are very specialist in something. I1 **risk management, balancing** MT is responsible, apart from all the things, for making sure that all the required experience and knowledge finally arrives at the right time, and the project team is the challenge. I1 **specialization** We have a management team where it's four of us, architects and a managing director, and each of us has a certain task. I4
management team	**shift of responsibilities, office ambition** Basically, it was just three partners, and back in the day was actually four partners, who were just running one studio. Or they called it an atelier back in. So it meant a very direct involvement of the partners and you see that, this is now translating basically to this, something a bit more complex. The scheme of the office is complex, exactly like the question is what happens if in the end in five years or so, partners are stepping out? I3	**office ambition, communication issues** I know that person A wants to do a competition somewhere in the next year and then person B and C would like to specify or specialize a bit more in the later phases. But I don't have the feeling that this information gets to the management team, it's not actively used. Because they're in their eyes or in the eyes of the direction, I think there are more urgent matters to it than to which is a sudden problem in the planning and billing. Maybe people are actually listening to it, but then at least there's no one telling them that it happened. I9	**specialization** It's giving you the freedom or giving you the flexibility to grow whatever you want to grow, so you are not forcing anyone to become a BIM captain. It's like something like people feel inside. Kind of this side of interest over there. I11 **collaboration** Currently, we are five captains, five people that are basically kind of helicoptering the project, and all of us are mostly assigned with our baby. I11
BIM team	**integrated contract, market demands** The problem is that the BIM model became a deliverable. Therefore, it became part of the contract. If the model has mistakes... it's your responsibility. And if that goes in the public tender and there are things there that are not supposed legally to be there. You can be prosecuted, juridically speaking. There is also a quality of the Model because there are all kinds of qualities in it. So if the contract has a very high demand and you don't manage to reach it, you don't get paid. I2	**technological resistance** Let's say on the table right now in KAAN forcing senior stuff, a very strong word, but yeah, let's say forcing. It's forcing project leaders to understand that they don't have to look at 2D plans anymore, there are more dimensions starting to be.. Yeah, it's like it's not just about your beautiful plan, which looks fantastic. I12 **limited experience** And then there were people like the BIM team because it was also the first time for almost all of us that we worked in Revit. So that was also a drama. And that cost many, screaming people and crying BIM managers, so that was the best I think we could manage. I10	**mandatory training** I think also would help is having obligatory workshops because right now what you notice for example also here in the office is that if you would like on a very bit of small scale, let's say have a nonobligatory hour or something. This is just too petting. That's it's too little. Then and that kind of thing, people are not completely involved in it. You know to get used to big transitions, I think you should be sort of neck deep in this. I12

Table 14 (continue)
Organizational internal transition
Source: by author (based on empirical data)

Organizational Transition	Example Triggers	Obstacles	Opportunities
office size and structure	**responses to global events** *The office was growing. So I entered it just one month before the crisis. In two months after we end up to 25 people. It shrinked quite a lot then. I2*	**Lack of human resource management** *I've seen a lot of people leaving in office in this period because of the fact, let's say, no gratification has been given or because we haven't talked to them enough to, let's say, sketch their career path and to manage their expectations. Yeah, not the office ones, but their expectations. I5* **communication issues** *I've seen a lot of colleagues passing by and a lot of them didn't find themselves at ease because they didn't accept the fact that they were not entitled to give an opinion but they didn't understand that to give an opinion you have to base it on something. It's a sort of it's rigor that we have. I5*	**shared values, complex project studio** *I think sort of the way that you approach a project and also your mentality and your ambition. So it's logical that people also like each other. A lot of them are also ex-students and so also you're collecting the people that you already know. Which fits in here… I think it helps in communicating because we have the same frame of reference for sure. If I ask Person A to draw something, he already knows what type of drawing I have in mind, or what type of graphics, or how I'm referring to things that when you start with someone from scratch, then that'll totally projects or different studios. Then you don't have that shared and there's going to be some miscommunication about, and doing it's not like it's super difficult. So you can easily learn it, but that makes it already better in communication already from the start. I10* **diversification** *In the development of the portfolio especially going through the crisis at the right time, the office managed to include more complex projects for more diversity in the portfolio with municipal projects like a museum or courthouse, the kind of diversity was very important to actually survive the crisis because in the crisis the housing market affected most of the commercial real estate. I3* **perceived support** *In the end, we all only need one thing in our professional lives and this recognition, there's nothing else there, nothing. And recognition is salary of course. But is everything else, is about being listened to, is about being given the freedom to try, is about learning, is about being able to interact. I2* **involvement, collaboration, communication** *The opportunity to make changes better implemented is to involve the project leaders in the contract changes or the talking structure. I8*

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4.3.7 Behavioral Internal Transition

Behavioral Transition / Example Triggers	Obstacles	Opportunities
remote working environment Teams platform **COVID-19 pandemic** The only thing we discovered is that it's possible to work remote, and we can reduce the amount of meetings being all together in one place, it's not necessary anymore... This doesn't work if a project is in an early stage, for example in a concept development. And that's makes it quick changes. Make quick changes. Than you need to be in the team environment. And that's makes it problematic because if you would like really to solve things, working from home makes that more complicated. So it changes, as soon as you switch in the phase and from team to team. I13	**Lack of human resource management, communication issues** Always think that the best thing about an office is your people. I think if without the people that wouldn't exist, but it felt like they [office] were not really supporting much where they were like more, more worried about. If people would really be productive or that they never felt that there were lacking. Asking how it was going like in a social sense... No, no one has an office at home, I was working on a little camping table and it was way too low for me and stick with books and a computer. I8	**trust, hybrid meeting** It would be best to have a hybrid. I mean in every direction. And that also then you need to put a lot of trust in your staff, that they understand and that they are able to make a decision by themselves, it takes a lot of trust to understand if they are able to make the right decision. I13
from CAD to BIM **office ambition, Integrated contract type** This transition and also your use of BIM was in a way forced upon the office by the client side because it wasn't integrated part of the contract scope. OK, this BIM, this building information, and all is actually what would then be used for both the engineering and designing part, but also in the end as a build model to do the maintenance and operations of it as well. So This is why because Projects A and B were done in such a way that it was a DBFMO structure. I12	**technological resistance** It's a very slow process and it's still an ongoing process. First of all, we have to convince colleagues that this new process is not slowing down the planning. Project leaders require the most convincing, there are some who have experience using BIM, but those without do not even know how to open the program. They don't have the right expectations of BIM and cannot oversee what takes time to produce or are not aware of the latest situation in the model. I13 **communication issues** It's always difficult still, therefore you need to force project leaders... he's not a transitional 25-30-year-old guy. It's a transition of a 50 year old people and it's different. It's very difficult. How do you solve it? Do you make boot cups? Did you start pulling people in the same room and trying to, let's say, show them? But this goes both ways, meaning you require also a certain investment on their part if they are not fully agreeing on the change, no matter how much you do... Out of probably 30 people in the office, if you're lucky, five of them will follow you. So it requires us either commit to them. I11	**specialization, flexibility** It is very helpful and how it works is like imagine that you have soil and then you're planting seeds. So these seeds are the people and there's some seeds that they're growing. These people start showing interest in the methodology, or interest in the tool, or interest in the process. So we cannot pretend we cannot ask people or everyone to have an interest in that one specific topic. So it is, which I guess is one of the best upgrades ever. It's giving you the freedom or giving you the flexibility to grow whatever you want to grow, so you are not forcing anyone to become a BIM captain. It's like something like people feel inside. Kind of this side of interest over there. I11 **communities of practice** If I had my own firm I would like to just almost solely try to employ open-minded people, because I think in a sense being open to changes and being generally interested, is all in it. It works well in a positive mindset. A positive flow also within a team and a quicker integration of new development changes. I12 **bottom-up initiatives, continuous learning, ambition** I never had any training in any office. No one trained me. No one showed me anything regarding technology. Everything I had to do when I was leaving the office at home. In my own time apart from work I like it. I enjoyed it because I thought it was the future. I11
more collaboration **office ambition, Integrated contract type** you designed with the entire team from the beginning, but we still see also in Belgium and also in France. They started now doing that. We see a lot of design and build structures, so that means that you tender already together with it a builder and for a project. So from day one, you are in a team with the contractor and with the engineers. I1 **values shift, inclusivity** 30 years ago we didn't do it. It was a bit of the time of this 'start architects'. We thought we could do it ourselves. We didn't need another. I think there are two changes. One is that society changed completely. The years of Star Architecture are over. Now there have been many developments in society in Holland that have to do with an imbalance between the establishment and minorities. These developments influenced us. I6	**communication issues, role of the architect** With sustainability advisors, I would always expect that they have to think along me and together with me and design the project together with me because sustainability these days like a core kind of design...sometimes you would end up having some advice that is normally very much involved in later stages of the project and you realize that after like 1-2 meetings that he(she) starts suggesting you very detailed solutions in the beginning. I7	**external collaborations, balancing** sometimes a bit too much what I call knitting and they used to build up their designs, all the detail to the bigger part. So that when I see that and then it's not something that you know from the beginning, but you see that in two or three weeks. Then we say, OK, they are working like that. That means that we have to keep an eye on the overall on the concept in the idea. So then we put the emphasis on that and that we discussed them like OK, that means for the team it's better now if we don't bring that person because that person might be tempted to also start knitting and then it becomes the knitting club. So we have to bring another person that makes sure that the there is a big pictures. I1 **shared values** the way the Dutch market has organized itself in the past years, it's true that the competitive dialogue was structuring part of this DBFMO projects because of the reason that the client selecting the quality and the price, but they were also judging somehow the skills and the attitude of the candidates. I5

Table 15 (continue)
Behavioral Internal Transition
Source: by author (based on empirical data)

Behavioral Transition		
Example Triggers	**Obstacles**	**Opportunities**
work-life balance		
social status change, COVID-19 pandemic	***overwork, technology adaptation, time management***	***perceived support, time management***
The amount of use of this Friday afternoon drinks... the group of people changed and those people got kids. So it's also different, but also the younger people tend not to make use of this opportunity to drink beer. I think you can read something about if there's a drink after work. If people like to stay in the office a bit longer or not, or if they all won't work on Friday anymore... I think before Corona was often every Friday until late. I8	after finishing the design and actually, I think even after finishing the building almost, we had to work a lot on the BIM model to make it fit the requirements. And actually, there were three people doing that and one of the people got really overworked and really depressed. I9	That's my biggest pride you can win a competition by having the people in the team going on time at home, not having dinner in the office, and having kids. That is something that years ago it was not even thinkable in this office. For project A we never did any weekend hours. We never, ever spent any evening, even any dinner here. I5
shared values		
When they [partners] were young they were 24 hours a day and you could work 24 hours. I've been in this office every minute. And now there's a difference. I don't know if it's if you have the same idea, but I think there is less overwork than 20 years or 10 years ago. I6		

4.3.8 Project Approach Internal Transition

Project Approach Transition	Example Triggers	Obstacles	Opportunities
technological advancement	**Integrated contract type** *The state was organizing them [projects] in that way and then they were nice kind of topics like Supreme Court or other projects. So for us it was. If you want to do a project like that, you had to do it in that contract form because that was assigned... We found out that contract form actually fits us quite well that we are able to work in that context with this short of dialogue and integrated form. I1*	**technology oriented** *The problem is that BIM becomes a bit of BIM, and BIM people like to make too much drama out of it, and it takes a lot of time, protocols filling in Excel sheets. But I think it's a problem of people, not of software that is making too much fuzz about things that are not so important. So of course you need to have a clear, clean model. You need to be rigorous in a work, but the model should be there to help us and to accommodate the design. Not all the way around. I4* **technological resistance, bias, generation** *It's noticeable within the office, is that a generation of people who worked mainly with CAD and Rhino.. are having sometimes second thoughts about BIM, and I think that the fact that these big projects forced us to work in it also causes some discussion internally in the office. Because there are quite some people who use different or a bit older methods. They are very skeptical because it takes longer to process certain changes. I12* **creativity limitation** *The whole BIM implementation and that's something we apply in the later phase. So first, like we are in the sketch design phase. Even in the preliminary design phase then [ot is done in Rhino and AutoCAD. It's really about design and they put it in the BIM software to make it a bit more technical, but the technicality of BIM can also very much limit you in your design. I10*	**fulfill the ambition** *Simultaneously I would say that new technologies with BIM and everything also supported that [integrated contract type]. So it became easier and better possible to do an integrated design. So it's sort of coincide that you could say and let to very good results. I1* **speed up the process, technology to fit culture** *we started using enscape in the office as a rendering program. Before we would always use render software that would take like 8 hours to render the design. And then we had special render computers and then probably like one switch was off and and then we had probably like one switch was off and therefore the whole render was corrupted and you have to start over again and this was the first time and it was me and Colleague A that started with it using Enscape and we could do these things life. Renders would take us 5 minutes... and we could adjust to life. And you could immediately see it.*
research projects: Optioneering Building Narrative	**COVID-19 pandemic, shared values, market demands** *We didn't have enough time to study, to research, and then COVID came. We had all of a sudden a lot of time to potentially study, and do other things. And I think that then is where we grow up in the mind that then also what we realized that then in 2020, the next generation of EU came as funding from the European Union for all kinds of money happening, in the project and that could be explained more. I5* **project complexity, connection with academia** *The research part has become very important in projects. The way we built a narrative back in the day was also diagrammatic and conceptual in a way, but simple, it was very often a very simple approach to the project. Every project has its own key feature, key problem, and key question. If you can isolate that and make that the most important to design, then that is basically what KAAN was. We enforce that back in the day, we just sort of simple, almost schematic way of analyzing, and now we do a lot of research, we have a lot of investigation going on to projects. If you see the kick-off books that we made the data that we include in everything that we do is still pragmatic, but the factors that we try to include are more diverse. I3*	**communication issues, project complexity** *It is very difficult to keep everybody informed about the project. Also, some people simply can't follow... Some person simply knows everything that is happening in the project and at the same time a person sitting next to this person...simply always complains that it's not clear what is happening, in the project and that could be explained more. I4* **extra options, different approach** *I think also sometimes optioneering could seem a bit overdone in the sense I gave 20 different options in a row can be slightly intimidating for people. But then there are also a lot of people that say we're not from complex and working on other [complex] projects says like, just do like three really good options and different ones, and then afterward you know start narrowing down. I mean, it's a design method or tool rather than, which is used a lot in the office. But I think everybody uses it in their own way. I12*	**communication, studio of complex projects, shared values** *We also apply [building narrative] in Delft at complex projects in all our projects and once you get used to it becomes very natural. It also creates a sort of historic archive of your whole thinking and process and all the discussions and it's a great tool for communication. So that's good and now we're applying it everywhere. Also, clients and stakeholders are always super happy with this. I10* **creativity** *Sometimes as a designer, if you stick to the best programmatic configurations, you have to be a bit flexible and the client also needs to be flexible if they want to have a beautiful building. I'm not saying we shouldn't follow like a function, but we can also follow function 95% with some flexibility, you need some flexibility in order to create a beautiful building. I7*

4.3.9 Cross-transitional analysis

The data represented in tables from subchapters 4.3.1-4.3.9 demonstrates the connection between the transitions, where certain features can be a cause of one transition but an example, opportunity, or obstacle for others. For example, 'integrated contact' is a cause of behavioral, organizational, project approach, and technological transitions, while simultaneously being an example of economic transition and an opportunity for procedural transition. To understand the interconnections between the transitional features, Figure 25 has been organized. It outlines the primary cause of the transitions, which, as shown from the empirical research, is 'global events.' These global events lead through the chain of interactions to the current transitional processes (light grey boxes in the diagram) observed in the case study. These processes will be further analyzed in the next chapter to see how knowledge is shared throughout their development.
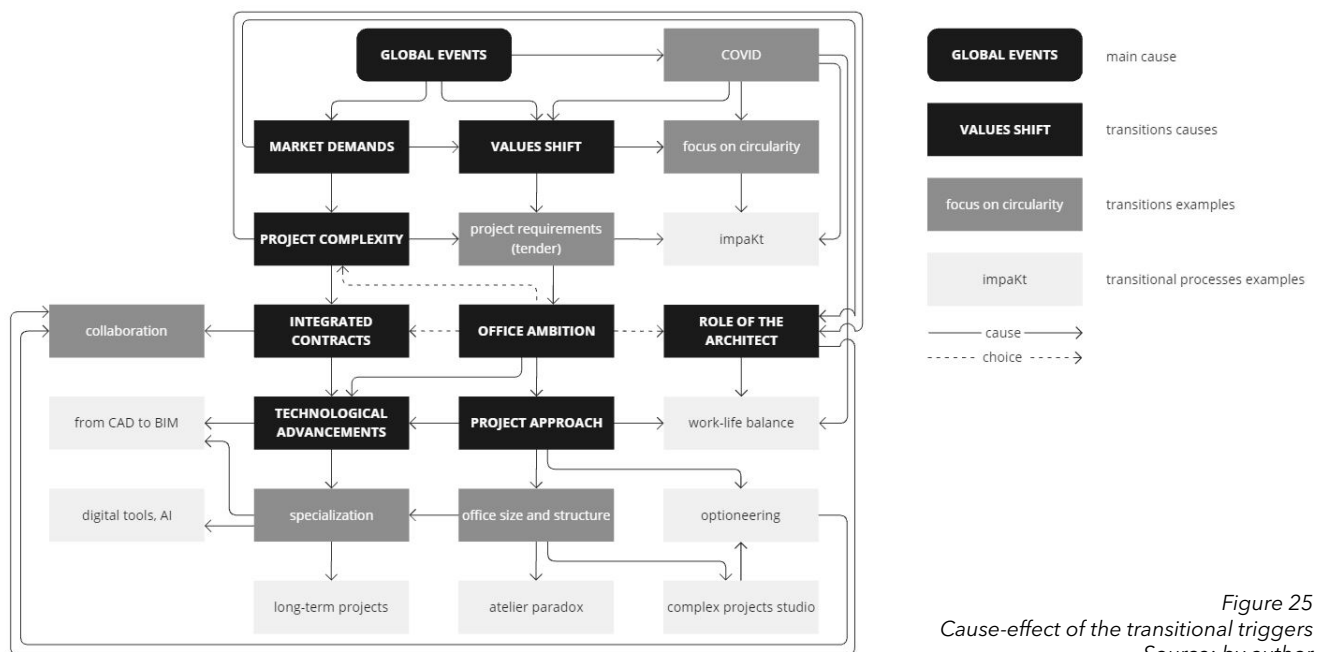
Figure 25
Cause-effect of the transitional triggers
Source: by author

4.3.10 Conclusions on Transitions

RQ 1: What are the **ongoing transitions** experienced by architectural practices?

Analyzing the tables with transitional features and the dependencies highlighted in Figure 25, the following hypotheses have been made regarding the nature of transitions:

External transitions are mainly top-down driven; therefore, architectural companies can only react to global changes. However, office ambitions can define the niche that architectural practice can acquire through a proactive approach.

External/Internal transitions within the company are more bottom-up driven (company to market) until the requirements become mandatory (or mandatory for certain projects). Therefore, the company has a choice of whether to invest time and effort in particular specializations.

Internal transitions for the architectural company can be driven top-down within the company, as well as through bottom-up initiatives with company support.

Transitional processes, outlined in Figure 25, such as the transitions to *BIM*, the implementation of *digital tools and AI*, the adoption of specific methodologies such as *Optioneering* and *impaKt,* the transformation of the company structure (*Atelier Paradox*), investment in future research through academia (*Complex Projects Studio*), and changes in *work-life balance* priorities represent the steps currently happening in the organization to respond to ongoing transitions.

4.4 RQ2. Knowledge-sharing

In this chapter, RQ2 will be answered by explaining **"How does knowledge sharing influence ongoing transitional processes in architectural practices?"** based on the practical findings and a theoretical framework drawn in section 2.3.

This chapter is organized as follows: First, the influence of knowledge-sharing on daily and transitional processes in this case study will be analyzed. Then, the alignments and conflicts between the analyzed processes will be highlighted. Finally, a hypothesis on the nature of these processes will be proposed.

Code	Code	Code	Code
● INTERACTION	● METHODS	● TRIGGERS	● ENHANCEMENT TACTICS
● INT_actor/actor	● M_building narrative	● TR_collaboration	● ET_C_Coaching and Mentoring
● INT_actor/AI	● M_diagramming	● TR_contract	● ET_C_Culture of caring (trust and cooperation)
● INT_actor/artefact	● M_Impact	● TR_delegation	● ET_C_High band-width communication
● INT_actor/group	● M_optioneering	● TR_education	● ET_C_Knowledge-sharing norms
● INT_actor/tool	● M_Structured thinking	● TR_flat hierarchy	● ET_C_Perceived support
● INT_group/context	● M_value-based design	● TR_giving freedom	● ET_PA_Developmental evaluations
● LEVEL	● OBSTACLES	● TR_identity	● ET_PA_Reward knowledge-sharing behaviours
● L_XL_interorganizational	● O_appearence oriented	● TR_long term vision	● ET_PA_Summary Reports
● L_L_organizational	● O_bias	● TR_micromanage	● ET_PS Space for face-to-face communication
● L_M_project-bubble	● O_Bureaucracy	● TR_prioritizing	● ET_PS_online communication
● L_S_project	● O_communication isuue	● TR_project	● ET_PS_Talk Space
● L_XS_personal	● O_control	● TR_project complexity	● ET_S_Communication skills
● PARTICIPANTS OUTCOMES	● O_culture	● TR_risk management	● ET_S_Employee referrals
● PO_Architects	○ O_detail oriented	● TR_sharing work	● ET_S_Person – organization fit
● PO_BIM Managers	● O_generation	● TR_side activity	● ET_T_Intranet and E-Library
● PO_business development	● O_habits	● TR_specialization	● ET_T_Technology chosen to fit culture
● PO_client	● O_HRM	● TR_studio_complex project	● ET_T_Technology to enhance existing social networks
● PO_external stakeholders	● O_ignorance	● TR_team spirit	● ET_T_Training to use technology
● PO_Management team	● O_information sharing	● TR_time management	● ET_T_User-friendly information technology
● PO_Project Designers	● O_isolation	● TR_transparency	● ET_TD_Departmental Meetings
● KT_KNOWLEDGE TYPE	● O_limited experience	● TR_values	● ET_TD_Extensive training
● KT_conscious tacit	● O_limited responsibility	● PARADOX	● ET_TD_Formalized orientation and socialization programm
● KT_explicit	● O_monotonous work		● ET_TD_Informal Knowledge Workshops
● KT_unconscious tacit	● O_pressure		● ET_TD_Knowledge Exchange Seminars
	● O_talent migration		● ET_TD_Team-based/cross-training
	● O_technology adaptation		● ET_WD_Co-location
	● O_time management		● ET_WD_Communities of practice
			● ET_WD_Interdependency
			● ET_WD_knowledge teams
			● ET_WD_Teams/cross-functional teams

Table 17
Primary Atlas.TI codes for knowledge-sharing
Source: by author

This chapter analyzes knowledge-sharing processes in KAAN Architecten through the four interaction domains of the knowledge diamond (Bekstas, 2013): *Context* (group-context), *Social Practices* (actor-actor, actor-group), *Tool* (actor-tool, actor-AI), and *Artifacts* (actor-artefact). It will outline how this interaction occurs at the *inter-organizational (XL)* level, *intra-organizational (L-organizational, M-project bubble, S-project)* level, and *individual (XS)* level.

The following subchapters 4.4.1-4.4.4 have the following purposes: First, to highlight daily interactions through the perspective of the knowledge diamond, and second, to position the long-term transitional processes defined in chapter 4.3 within this structure. These processes will be analyzed using the same structure of their causes, obstacles, and opportunities, where the latter two are chosen based on their frequency in the interviews. The bold italics refer to Atlas.TI codes, while the quotes are chosen to highlight diverse opinions on the topic. Data on the frequency of mentioned items is collected in Appendix F, capturing how many times interview participants referred to specific codes.

4.4.1 Knowledge sharing. Social Practices

To review the knowledge-sharing processes between *actor-actor* and *actor-group,* Table 18 has been created. In addition to Table 18, the following layers of interaction have been identified: departmental, cross-departmental, bubble, project, generation, family (age of children), gender, sports group, cinema club, and chess club (Personal Observations). Regarding online interaction, platforms noted include MS Teams meetings, MS Teams chats, MS Teams channels, and MS Outlook for emails.

Table 18.
Social practices, categorized by the level
Source: by author

SOCIAL PRACTICES				
(XL) INTER-ORGANIZATIONAL	**(L) ORGANIZATIONAL**	**(M) PROJECT-BUBBLE**	**(S) PROJECT**	**(XS) INDIVIDUAL**
Building Blocks *(informal knowledge sharing event about projects, technologies etc. approx. every Monday)*	MT+MD weekly meetings	weekly to-do meetings	project meetings	spontaneous interaction
Building Rocks *(Friday drinks once a month)*	BIM meetings	weekly progress meetings	spontaneous interaction	mentoring
Site Visits	spontaneous interaction	weekly departamental meetings	online collaboration	progress check
Summer Drinks	informal interaction and bottom-up events *(cinema, exibitions, events, etc.)*	spontaneous interaction		helping others
Festive Gathering		top-down research initiatives		annual evaluatoin meetings
Client meetings *(online, in the office, at the client's office)*		informal interaction *(sport, socializing activities)*		
Stakeholders meeting *(online, in the office, at the stakeholders office)*				
Collaborators meeting *(online, in the office, at the collaborators office)*				
Sub-contractor meetings *(online, in the office, at the sub-contractors office)*				
Suppliers meeting *(online, in the office, at the suppliers office)*				
Office lunch hour *(informal communication)*				
Networking meetings *(for senior members)*				
Complex projects Studio (TU Delft) *(several employees are teaching there together for part time)*				
External events *(conferences, workshops, real estate events, PR related events)*				

The approach to architecture at KAAN is based on oxymorons (KAAN Architecten, (2022b), Interviewee 6). Surprisingly, the interaction within the office also features certain paradoxical characteristics, referring to the hybrid organizational structure, which represents a perspective on how the concept of an architectural atelier can be transmitted to a medium-large size architectural company by implementing the features of flat hierarchy and introducing specialization. In this research, this phenomenon is called the **"Atelier Paradox,"** with its particular features analyzed in the Table 19.

Table 19.
Social practices transitional processes
Source: by author

Social Practice			
Example	Triggers	Obstacles	Opportunities
Atelier paradox	*organizational, project approach, procedural, economical transition*	**communication issues** *We are not people's people. There's like certain like I would say like touch it by God people that they can communicate fantastically. But let's say 90-95% of our target, they're incredibly bad at communicating. We don't want to share the information. We don't want to collaborate with others. We just want to do our thing and we don't care about the others, which is very bad because things should be about collaborating. I11* **lack of HRM, specialization, project over people** *I think it's for all the people who work with us, it's always good to change a bit of perspective and be able to work in different phases and the risk is a bit that what usually happens in our office is that people get appreciated in a certain position or certain phase or certain set of qualities which means that they are kept there because people know that they are good at making renderings or good at making details. But I think it can also help the people how to grow, to be put out of their comfort zone sometimes, and but maybe that's also part of a more general problem in our office that we don't focus so much on human resources. I think so and probably that's the case with a lot of architecture offices because they still see themselves as like a creative hub of a small scale and you just join because you like it and then we just go for it without reflection. I9* **lack of HRM, lack of ambitions** *I think sometimes people expect that it's like a team of managers that will put you there where you can reach your goal. Think it's really something you should follow yourself, or try to reach. I8* **identity, label** *I think the office is in a way also very flat. So MT with we hadn't them before. It's quite new still. Also for me, you still see it as partners, and then the group of people, we don't wear a sign of a project leader or a project architect. This is changing like new people get a different function but before we were all the same function, we're all general term of people that work in the office, but it makes it difficult to have a goal. I8*	**trust and communication, transparency** *knowing that the flow of information is an issue, we try to involve people more in obtaining that information. So no, we cannot all sit at the meeting because that's also not professional and there's a natural hierarchy in that sense. The same faces must always show up at the client, but you bring someone along sometimes and if they cannot physically be there, they can always listen in to the meetings. I10* **personal ambitions, specialization, bottom-up** *I think it was mainly arranged on skill and affinity. I think naturally in teams there are always people that are willing to take on more responsibility, that they're very clear about that, push to give the always the extra push. Some people are naturally fine with not being the principal in the team and I want to do that nine-to-five job and then their free time starts and all versions are OK. But I think it went quite naturally in that sense. And that people that just were either better at Revit or more on top of the information or gave it more got that responsibility. I10* **giving freedom, perceived support** *So for a good manager, of course first step is understanding how you are and where you stop. So you don't micromanage and frustrate others, that's the most important, but also understanding all the others and where they can try and what they need. I2* **project complexity, specialization** *I guess if it's a complex project, then it's definitely a division of the building into some groups so that each expert is different and well like you have your own baby and you know everything about it, then it is very smart from the point of view of just the development of the project because I have my own internal expert, who is specifically assigned to that role. I14*

4.4.2 Knowledge sharing. Artifacts

The daily artifacts for knowledge sharing are highlighted in Table 20. While several artifacts have been developed as an ultimate response to ongoing sustainable, technological, and project approach transitions, these are outlined in Table 21. The artifact descriptions can be found in chapter 4.2.3 of this case study introduction.

ARTIFACT				
(XL) INTER-ORGANIZATIONAL	**(L) ORGANIZATIONAL**	**(M) PROJECT-BUBBLE**	**(S) PROJECT**	**(XS) INDIVIDUAL**
contractual agreements	Office manuals	weekly projects planning	project requirements	working contract
books and publications about the office	Working methodologies (ex. Optioneering, Impact, Building Narrative, Competition Handbook, Design Kick-off manual, Furniture catalog)		presentations	evaluation form
projects photos	Equipment manuals		project boards	personal notes regarding the projects and agreements
academic materials for Complex Projects Studio	Software guidelines (Adobe, Autodesk, Office) and tutorials (ex. 30min BIM course for daily learning)		drawings packages per stage	
office webpage and social media	Software standards (Adobe, Autodesk, Office)		3D models	
	Software tutorials		2D drawings	
	Software libraries		diagrams	
			sketches	
			renders	
			project description texts	
			weekly project planning	
			to do list	
			meeting minutes	

Artifact			
Example	**Triggers**	**Obstacles**	**Opportunities**
impaKt	sustainable, procedural, project approach, societal, technological, economical transition	**certification** The usual system is that there is competition, there is a promise or a vision, that's ambitions. And then reality kicks in: it's too expensive, things have to go and sustainability is often a part of it. It could be a decision for the client. Let's say we want the BREEAM level but not the label. And then we don't have a label. I6 **measurability** Look, you could say that impaKt is a tool that we have developed for our understanding. So in principle, it's a tool that we use to reflect on our design work. Several criteria are developed within the wheel of aspects that are relevant for sustainability or in general the building quality or sustainability. What we have never been able to do up to now is to make those criteria measurable. I5 **communication issues, limited experience** It's now very and a real change is that I think for example the impaKt and the carbon things. It's very difficult. So I think the office in general, it's a difficult office to really talk about sustainability and then I think would be behind on this. I think we find it quite hard to, I couldn't really pinpoint why. I'm doing now a competition and they are also asking for some very sustainable buildings. Everything needs to be like, perfectly sustained... I'm lacking the tools to respond. I don't, and I sometimes don't know where to start... I wanna know what tools we have and now we have impaKt. But now for me, that's not the tool. It's still a presentation. I8	**shared values, investment in the future** I think impaKt, for example, could help the people, to the architects that are going to meetings and it could help to make them aware of reports of this and in this building block, I also want to say you have a position in the future of this office by believing in that these kind of things are important for the future of this project and also for environmental reasons. I6 **communities of practice** So we did those booklets and we started bringing them to the trade shows and slowly people understood more and more. It's not perfect, so I would say 60% of the office thinks like this and tries to apply, but it's OK, Everything is a process, you just roll with it and try to improve a bit of it. I2 **specialization** I think the only way to really make this better is to have way more than spend way more time on this topic to really have someone who is chief sustainability and who goes to events or knows all the literature. I8
Optioneering, Building Narrative, Competition & Kick-off booklet	project approach, procedural, behavioral, societal, organizational transition	**communication issues** But I think there are also a lot of people within the office and working on other projects who have a bit less optioneering or use their variant of it. I mean there I think also sometimes optioneering could seem a bit overdone in the sense I gave 20 different options in a row can be slightly intimidating for people. I12 **short-term vision, time management** That happens also and a lot of times here people don't have a long overseeing of the problems. In the the project, maybe yes, but sometimes maybe I'm wrong, but this is how I see: Ohh I'd have to give you, I have to produce something. But what for? What is the need for this? You have to give yourself a lot of time to think and then you produce. If you start doing without it, it's a waste of time. I16 **technology vs design identity** Because there is a big risk that because you can, you're gonna make a lot, but the trick is not to do it like that. The trick is to give yourself sort of clear guidelines. Like what do I wanna know what is the primary question that I'm asking myself and how can I now choose and not make 100 options like connect it to three I have also not managed this yet, but that's very challenging. That's one of the comments that you get on this approach and the other one is more by people who have never that still have issues with any software. They think and we are now making image architecture instead of actual buildable architecture because we can make anything an image. And I also always say that out loud. I have no tiles of 60 by 60. They always align with my images and that's not always the reality. You focus too much on that and not thinking about how you build it. That's the comment that I get a lot. I10	**flexibility, collaboration, identity, structural thinking** Because the issue is that you give them a fantastic design and that's of course I think that happens if you do some very particular architecture and it can be amazing, but it completely falls apart as soon as someone pulls one of the threads and maybe the advantage of the fact that KAAN architecture is quite simple and has a certain level of repetition. It also means that you can change it without, it'll losing the main concept. So I think it's also smart for us to approach it that way maybe that's our version of sustainability and communication with the client. That's like a plug-and-play thing that can help us in further workshops and negotiations with the client later on. I think we should try to sell it like that. I10 **knowledge base, E-library** That was the idea was to make three books. One was the competition catalog. One was the optioneering and one was the design brief that everybody could use in their projects. I15 **personal interpretation** That's also how photography works for me. I don't go out there and I don't go all the time and make one picture, but I see there's potential there and I'll make a few. And then you say, OK, this works... and that's already optioneering. I6 **high bandwidth communication, shared values** We also apply [building narrative] in Delft at complex projects now do in all our projects and once you get used to it becomes very natural. It also creates a sort of historic archive of your whole thinking and process and all the discussions and it's a great tool for communication. So that's good and now we're applying it everywhere. Also, clients and stakeholders are always super happy with this. And they start drawing it themselves. I10

4.4.3 Knowledge sharing. Tools

The key tools used by KAAN Architecten employees during actor-tool interactions are outlined in Table 22, while the key processes of technological transitions are highlighted in Table 23.

TOOLS			
(XL) INTER-ORGANIZATIONAL	**(L-M) ORGANIZATIONAL**	**(S) PROJECT**	**(XS) INDIVIDUAL**
BIM models	MS SharePoint	BIM custom families	timechimp attendance
	MS Office	Shared files	locket vacancy
	MS Teams		PC
	Adobe *(Photoshop, Illustrator, Indesign (Shared-file))*		
	AutoCAD		
	Enscape *(Real-time render)*		
	AI: chat GPT, language models		
	Rhino		
	Remote work connection		
	Video conference equipment		
	Printers and plotters		
	Model making equipment		

Tool			
Example	**Triggers**	**Obstacles**	**Opportunities**
BIM (Revit)	*technological, procedural, project approach, organizational, societal, behavioral transition*	**technological resistance, generation, bias** *BIM becomes mandatory and everybody has to accept it. Then of course it's logical for somebody who's 50 and has been working with CAD with whole life. Yeah, it's very difficult to make this transition to any other program to actually check the design and if there are clashes and whatnot. It requires change and some people are better in this than others. I3* **detalization, technology vs design identity** *Most colleagues have the tendency to model too detailed and do too much in an early stage. A contract defines which level of detail is required per phase, so we should stay close to that otherwise we risk spending too much time and making it too complex. You have to understand if you make something very specific and this situation occurs 100 times, you have to adjust it 100 times and that takes a lot of time. I13*	**integrated contracts, collaboration** *We found out that the contract form actually fits us quite well and that we are able to work in that context with this sort of dialogue and integrated form. Simultaneously I would say that new technologies with BIM and everything also supported that. So it became easier and better possible to do an integrated design. I1* **specialization** *It's giving you the freedom or the flexibility to grow whatever you want to grow, so you are not forcing anyone to become a BIM captain. It's like something like people feel inside. Kind of this side of interest over there. I11* **coaching and mentoring, perceived support** *By helping others I notice that I also gain experience myself. So of course you try to help them and answer often by analyzing the problem. I try to avoid faking something and look for the source of the problem. While doing that staying close to what we have as a standard in the office. We also try to advise. So you see that what they're doing is not in line with what we should do in terms of a contract. Try to explain that to them and make sure that they understand the consequences of what they're doing. I13*
Enscape	*technological, project approach, societal, behavioral transition*	**time management, role of the architect** *I won't always be an advocate of Enscape. There are a lot of people that hate it because it also means that you're gonna make a lot of images because just because you can at some point we were making images and it was required. We were asked to but also the client got spoiled, so they thought we had at some point images of storage spaces because they just wanted to see what it looked like. I10*	**process optimization, time-management** *We started using Enscape in the office as a rendering program. Before we would always use render software that would take like 8 hours to render and then we had special render computers and then you would come up to the render the next day and then probably like one switch was off and therefore the whole render was corrupted and you have to start over again and it was the first time that we could do these things life. Renders would take us 5 minutes...and we could adjust to life. And you could immediately see it. I10* **collaboration, communication, resource efficiency** *It's also a great tool for people who are bad with things like photoshopping or just general imagination. Or we could instead of working for six months or something and then showing the clients an image while before you were depending on you verbally being able to explain any image... And now we could just do it live with them and not only have images of small things immediately or large things, but also make a lot of movies of people walking through the building that was before that was either we couldn't do it and it was incredibly costly, or it would take so much energy. I10*
AI **BIM-Enscape-AI**	*technological, project approach, societal transition*	**technology vs design identity** *Parametric is very often used to make something that you yourself cannot do, same as AI, yeah, so if something is parametrically designed, or AI can we still explain it? When I'm presenting the project I'm showing an image that is parametric design but I am not able to understand and to explain why it has the shape it has because of some parameters somewhere generated it. It's not KAAN. Then if I get a question or criticism and I cannot explain or I cannot counter it, because it's too complex for me to understand, we're not doing it right. Well, so our desire to control the project may sometimes also be holding us back from experimenting with too many parameters. We're very much interested in parametrics when it's about facts, winds, sun conditions, rain conditions, pragmatism in a building that is grid sizes, etcetera. It's about former shape and design, I think in the end the thinking needs to be able to catch up with the software. I3* **bias** *Every time, like even in the Industrial Revolution, everybody was against the machine because the laborers were afraid they were losing their jobs. In the revolution, factories were being burned down, and it was the. That is also what happened in the digital world. It's saying there's an Internet revolution. People are really afraid of it and object to it and say who's there? Same with social media, with AI people get this fear of images of totally losing touch with reality. I3* **custom dataset, project complexity** *It's also interesting to automate stuff and get your AI or your script for a ton of different options. But that is still difficult so far to always match with requirements. For example, you know with a lot of competitions and the entire output specifications come so which is your booking which is stated like OK, what rooms can be gonna connect with what we etcetera. Well, that kind of input, we still have a bit of trouble of exactly matching as input to your script, you know which could be run to connect all of these things. I12*	**process optimization, investment in the future** *Now in the office, we do a lot of these things manually. I think in the future if you really can control this process, this method, then you can maybe also ultimate certain steps with people now are working, maybe you can, for instance, do the evaluation based on the inputs. Maybe that can be automated. More you know, and it's already saved people's work. So maybe you skip these steps then doing these, or letting these AI maybe, develop these options, but then to be able to choose and go to combine the integral option I think you still should do that by thinking about it. I15*

4.4.4 Knowledge sharing. Context

Figure 26 and Table 24 refer to the daily interactions in the face-to-face context in the office. Meanwhile, the transitional processes of TU Delft *Studio of Complex Projects* and the *"school of long-term projects"* (Table 25) outline the transitional processes that refer to the influence of context.
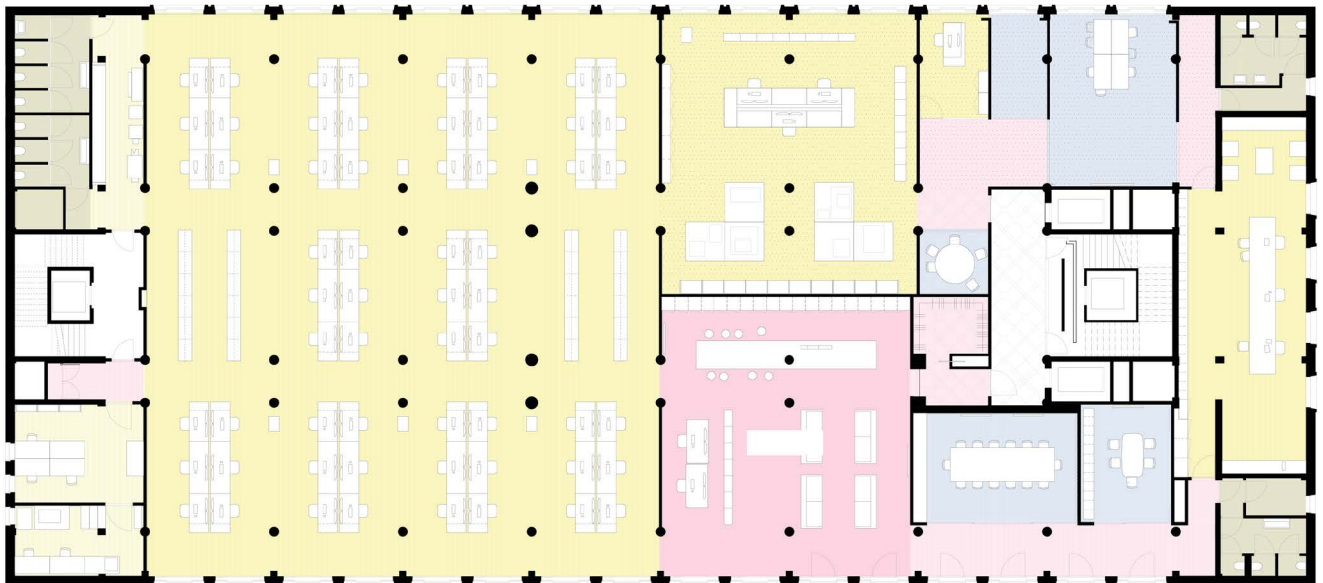
Figure 26.
KAAN Architecten office at Rotterdam,
by the type of the space
Source: by author

Table 24.
Office space, categorized by the level
Source: by author

- computer working space
- workshop working space
- informal space
- corridors
- meeting rooms
- toilets

CONTEXT			
(XL) INTER-ORGANIZATIONAL	**(L-M) ORGANIZATIONAL**	**(S) PROJECT**	**(XS) INDIVIDUAL**
kitchen	model making room	working space allocation next to project peers (optionally)	working space
meeting rooms	printer room		
toilets	storage		
	bicycle storage		

Context			
Example	**Triggers**	**Obstacles**	**Opportunities**
Complex projects studio	*project approach, organizational, behavioral, societal transition*	**person-organization fit** *You're collecting the people that you already know. Which fits in here. So, not always sure that's good, because you create this sub-cult, but it's a lot of people. I think it helps in communicating because we have the same frame of reference for sure. I10*	**mentoring and coaching, optioneering, structured thinking, project complexity** *To be able to brush these big public buildings, it's already, I would say more difficult at a certain point. And that's why they teach you this method, which is optioneering. It's quite a rational approach to the design I would say. So it lets you first analyze the data do some benchmarking into options and you compare and evaluate it. And based on that you can actually sort of choose an option that is not like your guts telling you like, but more data kind of approach to it and that there have some really strong arguments why this works better than the other ones, and that's super interesting to do. I15* **connection to academia** *Collaboration with academia it's crucial. There should be always a direct link between what's happening in academia and what are the actual market requirements. There's always this kind of this should be like a symbiotic approach where both are benefitting. That's for me, crucial. I11* **shared values** *I think complex projects you know would help you with these certain mindsets in terms of using this tool of optioneering. And with a mindset of working on very difficult flows within a project. I12*
Long term projects	*project approach, organizational, behavioral, technological transition*	**monotonous work, project vs people needs** *For the type of office that we want to be: I think it's the best option that we hire only the architects. But yeah, then we then we have to find a way to that they can deal with this boring stuff... last week we let colleague A out to another project for a week to do a competition, and help with the drawing, and he actually liked that, I think because then he can do something at another phase at another level of type of work and intensity. And so maybe that's a possible solution, although that's from a project point of view. That's always tricky because then you lose him for a while and you never know if they come back. Or if that other project has a delay or it takes longer. I9* **lack of HRM, isolation** *Maybe, the downside of this method because you're working on this isolated community expert. You also might feel a bit. Lost in a way? Maybe a bit like if you would, if you want to contribute to everything then you feel involved in the project and if you're really into this specific thing, what the again in the end, you don't see the result of it. They also might not feel that involved, and I think that's a bit of the downside of this whole thing. I15*	**perceived support, monotonous work, project complexity, learning by doing** *The first six months I have the feeling that we go around and make the same presentation about the same private buildings 10 times and this is some kind of endless process... and it is a little bit demotivating of course. At some point I realized that yes, we may be doing the same thing, but this one and the same thing is such a complex task that any other task to do after that is so elementary or to divide how to coordinate people, how to divide the task we have. Well, it turns out to be so simple that it seems to me that long-term projects school is all about, that you spend some time on such a complex task that after that any other task is not so complex. I14* **side activity** *So I think that's also good. I think what might also help, which is something I think it should very consciously, is that now almost everybody on the team, at least from the KAAN side, because we have some side activity. So that it doesn't become too full or too intense. So either they're doing a small project like once a week on the side still for KAAN, but at least it takes a little bit, or they're teaching in TU Delft. That's a side thing and I think that's something people enjoy. I10*

4.4.5 Knowledge sharing alignments and conflicts

Although the daily knowledge-sharing interactions can be seen within one single dimension of knowledge-sharing, the transitional processes, even when assigned to a specific dimension, normally require the support of other dimensions. For instance, artifacts such as Optioneering are linked to the context of the Complex Projects Studio and Long-Term Projects in KAAN, but they also involve a lot of personal interaction and the mindset of people, which refer to the domain of social practices.

As can be seen from chapters 4.4.1-4.4.4, transitional processes are normally caused by multiple transitions. Although there is an original intentional cause, there are also secondary causes that align with the goals of other transitions. Meanwhile, these could also contradict other transitions, or contradictory opinions can be seen within the same transition regarding how this process can be developed. Table 26 outlines the alignments and contradictions for each transitional process.

Example	Primary Cause	Secondary Cause	Maybe in conflict with
Social Practice			
Atelier paradox	*organizational*	*project approach, procedural, economical*	*behavioral*
Tool			
BIM (Revit)	*technological*	*procedural, project approach, organizational, societal, behavioral*	*project approach, behavioral, societal*
Enscape	*technological*	*project approach, societal, behavioral*	*behavioral*
AI *BIM-Enscape-AI*	*technological*	*project approach, societal*	*project approach, behavioral, societal*
Artifact			
impaKt	*sustainable*	*procedural, project approach, societal, technological, economical*	*project approach, behavioral*
Optioneering, *Building Narrative,* *Competition & Kick-off booklet*	*project approach*	*procedural, behavioral, societal, organizational*	*technological, behavioral, project approach*
Context			
Complex projects studio	*project approach*	*organizational, behavioral, societal*	*societal*
Long term projects	*project approach*	*organizational, behavioral, technological*	*technological, behavioral, societal*

Table 26.
Knowledge sharing primary, secondary and conflicting triggers.
Source: by author

4.4.6 Conclusions on Knowledge Sharing

RQ 2: How does **knowledge sharing** influence ongoing transitional processes in architectural practices?

The features of transitional processes can refer to multiple transitions and multiple dimensions of knowledge sharing. Although they may be triggered by a certain group of transitions, it's unavoidable that there will be obstacles or contradictory transitions along the way. To deal with these clashes, chapter 4.5 will explore coping tactics that organizations and individuals can use to mitigate and balance these conflicts.

4.5 RQ3. Knowledge-sharing coping Tactics

In this chapter, Research Question 3 (RQ3) will be answered by exploring 'What **knowledge-sharing tactics** can be drawn to **cope with** ongoing and future **transitions** in architectural offices?' based on the practical findings and the theoretical framework outlined in Section 2.3.

The structure of the chapter is as follows: First, gathered knowledge-sharing coping tactics (KSCT) will be presented. Second, the selection and sequence of these tactics will be evaluated based on transitional processes. Third, the proposed framework will be revealed. Fourth, the components of the framework will be discussed. Finally, the progress of transitional processes will be evaluated based on the proposed framework. Table 27 outlines open codes in Atlas.TI, generated during the data analysis.

Code
● KST_KNOWLEDGE SHARING COPING TACTIC
● KST_adaptation
● KST_doing new
● KST_informal communication
● KST_intuition
● KST_learning by doing
● KST_learning from artefacts
● KST_learning from others
● KST_observing
● KST_reflection
● KST_take an opportunity
● KST_vocabulary
● KST_willingness to grow

Table 27.
Primary Atlas.TI codes for KSCT
Source: by author

4.5.1 KSCT analysis

During the selection of tactics, several challenges were encountered. At the beginning of the analysis, it was difficult to distinguish between causes and opportunities, as well as between methods (KAAN Architecten, 2023a, d) and company strategies such as *"diversification"* and *"specialization."* Secondly, there was a struggle to identify knowledge-sharing coping tactics that should respond to both transitional changes and knowledge domains through sharing. To structure the data, the categories of triggers, obstacles, and opportunities were introduced (Appendix F). Only after this sorting did it become possible to distill the actual coping tactics.

In the process of defining the coping tactics, 15 tactics were identified (Table 28). These were positioned and classified according to Parker and Endler's (1992) system of *task-oriented, emotion-oriented,* and *avoidance-oriented tactics*. The positioning of the tactics is subjective and based on explanations from empirical data. It is important to note that, for instance, the adaptation parameter is present in both task- and avoidance-oriented tactics and can refer to the perspective of proactive or forced transition. At the same time, the avoidance tactics, as seen from the quotes, are not considered counterproductive to transitional development. Tactics such as "*humor," "vocabulary,"* and *"informal communication"* support the transitional processes, although they function as reactive rather than proactive methods.

4.5.2 KSCT selection and sequence

To evaluate which tactics and in what sequence were used by the research participants during the transitional processes described in Sections 4.3-4.4, the development of these processes was analyzed based on empirical research. Several important points were noted. First, a similarity in the sequence between the processes was found. There were certain ideas and thoughts (*thinking* dimension) that had not been identified, followed by attempts to experiment with them and observe the outcomes (*doing*), and finally, if successful, sharing this knowledge with others (*saying*) (Table 29).

Therefore, for the thinking dimension, *KST_ambition* to change and *KST_intuition* were used. For the doing dimension, *KST_take an opportunity* and *KST_doing* new were utilized. For the saying dimension, *KST_reflection* and *KST_adaptation* were employed. The tactics of *KST_learning by doing*, *KST_learning from others*, and *KST_learning from artifacts* are present throughout the transitional processes. However, they are situa-

Coping Tactics		
Task-oriented	**Emotion-oriented**	**Avoidance-oriented**
KST_adaptation *It's about this thing about the fish, right? Don't give me the fish. Teach me how to fish I will get the fish myself. So I will not be hungry. But it requires time and it has to be, of course, according to properly considering planning, because it's taking my time, your time. I have to teach you. Then you have to learn and then you have an adaptation period. So you have to push, you have to push for communicating this thing. But that's difficult because architecture is usually a fast pace. I11*	**KST_ambition to change** *You have to be open to learn about it. One who's open to learn and open, to engage with the process of extending your knowledge, training yourself and also it's open to the idea that this will be the future and it will strengthen and extend our ability to design, then it works. As soon as you are not so much interested, consider it as something you have to do. Than it becomes quickly frustrating. I13*	**KST_adaptation** *We simply don't have time to do a long training and nobody is really interested in that. Lack of interest is also the reason we don't have more than a basic training. It's mostly that you just start in project. The best thing is a project in a very early phase, because the model is still quite clean and throughout the project you will have to put more detail. You have to define more with your design and then you get to know the program the best. You sort of grow with the project in experience. I13*
KST_take an opportunity *I think when we engaged to design an airport without having done before an airport, that was the biggest challenge that we have ever taken. And I think if we have demonstrated that we can do an airport without specific help or knowledge, then we can do whatever else. I5*	**KST_intuition** *There is a lot of gut feeling, you know? One thing that is common to the process in projects is that we do run a kind of SWOT analysis, but it's mostly inside my head. And because, yeah, it's strategizing contracts. There's not really a wrong answer. It's mostly about understanding what is the better answer. I2*	**KST_vocabulary** *The project bubble uses a very particular project vocabulary. The "nicknames" are given to the divisions of the scope of work, this vocabulary is used by the project team and further implemented in the communication with collaborators and clients. Observations Diary*
KST_doing new *I never had any training in any office. No one trained me. No one showed me anything regarding technology. Everything I had to do when I was leaving the office at home. In my own time apart from work I like it. I enjoyed it because I thought it was the future. Good. Fantastic, but to me, or the way I was trained... this is about you having to complain about task A, and if your boss or your superior is asking well by the end of the week I need to have this done. If I don't know how to do it, probably most likely most likely what will happen? I will get home and I will watch a couple of videos. I will check I will read a couple of blog posts and then by the end of the week I will have something decent. I11*	**KST_reflection** *You have to understand the problem, not the solution. So you have to know constantly what's coming, what's is pending, what's going to happen, what we need, what is so that when something changes, client calls and says I have to postpone something or we have stop, we slow down a bit or whatever that you immediately use that to solve a lot of problem. That means that you have to have very good in your mind how the game is standing on the board. Because then you can one problem is the problem here is the solution for something else. I1*	**KST_informal communication** *I mean it's also more of a social interaction. And what I think it does greatly is that it's presented to the entire team, let's say per presentation different topics and that's if they ever encounter a similar topic, for example, if you're talking about that you know, green facades, they did this in Project A. And if there's been a building block while there is, then in a competition, it happens as well. Then people know like ohh wait, but I remember that somebody in the team talks about this green model. I will ask him or her for more information. It helps with directing people to the right team members to ask the right questions and get the right information. It's sort of like it's a great way of getting internal references and an internal catalog more or less, available for everybody. I12*
KST_learning by doing, KST_learning from others *I think that's the main way of getting knowledge and also in a sense, sharing knowledge happens from learning by doing. So let's say that during projects, for example, I learned to draw detail during projects with my project leader at the time and you know he sat down with me. He was the first to say. Like, OK, I draw this, this, and this project A, and then I will do that and then we would sit down together and he would go with the red pen. And explain what you need together. So that kind of thing that and then there's I think the learning by doing is a lot of really happens a lot with one-on-one learning. I12*		**KST_rejection** *What sometimes happens here is like: -you need to do this -no, I don't know how to do it And that's it. Well, you are free. Let's say no, it's also an answer. No, it's also a possibility. I don't want to do it. I'm not capable of doing it. It's also an answer. This is something that for me was a cultural shock that I'm able to say no to people. I'm able to say no to the task. It's a cold front to me. I11*
KST_learning from artifacts *I think we already started doing this by setting up this competition manual. That I think already really helps because it's something that we were doing anyway, but not formalized. And therefore you're reinventing the same thing over and over again, especially when you do with people that didn't do it with you. And now we're saving a lot of time, but with already having this framework and just feeding it in. And also having other projects that did it the same way. So you have a frame of reference that is that you can see. I10*		**KST_ignorance** *But what is difficult, very difficult is to keep everybody informed about the project. Also, some people simply can't follow. That's, for example, something that I still don't know what to deal with, or how to deal with. It is that in the same team, the same level of the person. Some person simply knows everything that is happening in the project, but that other person simply always complains that it's not clear what is happening, in the project that could we explain more? Could we brief more? I4*
KST_observing *I think I have built up my way of being of coordinating projects by seeing what the others were doing and by judging what I liked and what I didn't like. I5*		**KST_humor** *There are lots of jokes in the daily conversations and during the meetings, which were not emphasized during the interviews. It helps participants to be involved and stay in a positive mood. Observations Diary*

Table 29.
KSCT, filtered by thinking-doing-saying dimensions
Source: by author

Example	Thinking	Doing	Saying
Social Practice			
Atelier paradox	*KST_ambition to change, KST_intuition, KST_learning from others* well, the change in the office I would say is that partners 20 years ago were for 40. So they were on top, you know. Involved in everything. When I started they told me what I should do. So the change in the office is that came from a three-person let the company grow and it's now much more, not necessarily layered, but responsibilities are much more shared. They have less intent to interfere too much. Then the system is working. They make the system work. And now it's working. But that's it, that's what changed. I think they don't have to steer much. I6	*KST_take an opportunity, KST_doing new, KST_learning by doing* I have done this for 15 years and the partners told me to develop it and it's going well. And as long as it's going well, they don't interfere. The only interference is that we communicate. And I usually have… partner A said a very nice thing: 'I have a license to fish'. It's about trust thing. I6	*KST_reflection, KST_informal communication* And then it's unofficial talks is all. We always agreed. It's not necessary to be described. I6
Tool			
BIM (Revit)	*KST_ambition to change, KST_intuition, KST_learning by doing, KST_learning from others* with project A, I was not so experienced and I was the only project leader and we had a new kind of contract system and there was the first project in BIM, so there was really big and really difficult to deliver first the on time and secondly of good quality. We had time to set up. So some of us did a BIM course which was five or four days, full days, external >	*KST_take an opportunity, KST_doing new, KST_learning by doing* and then my colleague and I could spend like six weeks or so setting up the model. So changing, and translating Autocad files into 3D mode and because we are just the two of us and we had enough time, it was quite relaxed actually and also we could control everything. >	*KST_reflection, KST_adaptation, KST_learning by doing, KST_learning from others* But then we didn't do details in Revit yet, so we kept them in AutoCAD to make it a bit more simple. But that went quite OK. And then in Project B, we did the full BIM project. But there we had a lot of professional experience helping us. So, we did that together with collaborators C. We're also the structural engineers and also the fire engineers, et cetera, but they also had a BIM team supporting us and we actually hired two people from collaborators C to put in our team to help with the BIM process. So we had quite a lot of gun power to set it up. I9
Artifact			
impaKt	*KST_ambition to change, KST_intuition, KST_learning by doing* If you take impaKt, let's say, you came from Brazil with the intention of hammering office with sustainability, and then with your intuition that we need a think-tank, a group of people that will think of it >	*KST_take an opportunity, KST_doing new, KST_learning by doing* then you initiate that and we started sitting, started developing a tool, that it was initiation, than we came to the conclusion that in order to have that we have to have the process of innovation, which were about developing some tools etc.>	*KST_reflection, KST_adaptation, KST_learning by doing,* which we started integrating into the project, and we ended up with the first element of insight… [I5 to I2 during the internal discussion workshop]
Optioneering, Building Narrative, Competition & Kick-off booklet	*KST_ambition to change, KST_intuition, KST_learning from others* I1 and I4 already had these ideas for some time >	*KST_take an opportunity, KST_doing new, KST_learning by doing* and they also worked by this method for some time >	*KST_reflection, KST_adaptation, KST_learning from artifacts* we discussed that we could work on this research and then only for one day a week and that's then about this methodology about the optioneering, and that was a bit, why are we doing the things we're doing… I think it was some sort of almost consolidated overview or summary calling for how the working method already was used in the office. I15
Context			
Complex projects studio + Long term projects	*KST_ambition to change, KST_intuition, KST_learning from others* Complex projects you know would help you with these certain mindsets in terms of using this tool of optioneering. And with a mindset of like working on very let's say difficult flows within a project and stuff like that >	*KST_take an opportunity, KST_doing new, KST_learning by doing* But I don't think that it's, you know, it doesn't educate an architect like working for five years at KAAN would be because there's, I think, and the learning by doing and that's where respect is, something I think in that sense, more valuable and more used in practice with the stuff you learn from the complex project >	*KST_reflection, KST_adaptation, KST_learning by doing,* I think that's the main way of getting knowledge and also in a sense, sharing knowledge happens from learning by doing. I12

tion-specific and can be present throughout the entire process altogether.

4.5.3 6 IN model

After rebranding the tactics to make them more memorable, the 6IN framework was created (Figure 27), where each step begins with *'IN'*. Hence, *'INtuition'* remains as is, *'ambition to change'* becomes *'INtention'*, *'taking an opportunity'* becomes *'INitiation'*, *'doing new'* becomes *'INnovation'*, *'reflection'* becomes *'INsight'*, and *'adaptation'* becomes *'INtegration'*. An unexpected outcome was that three of the chosen
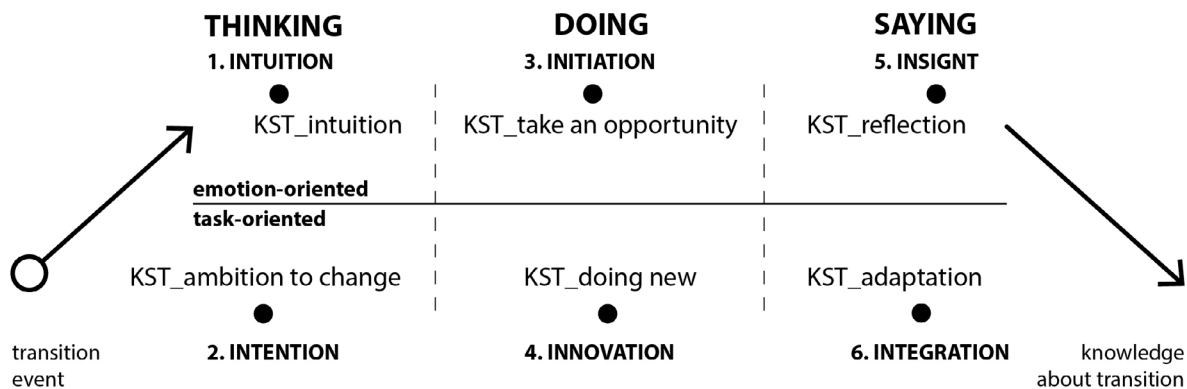
Figure 27
6IN thinking-doing-saying dimensions
Source: by author

tactics—*Intention, Innovation*, and *Integration*—are **task-oriented**, while *Intuition, Initiation*, and *Insight* are **emotion-oriented**.

It was also noticed that before progressing from the thinking-doing-saying dimension, several iterations or cycles occurred before the idea was ready for the next level (Figure 28). This observation led to the proposed framework highlighting three iterative stages, forming a process spiral. The transition process development
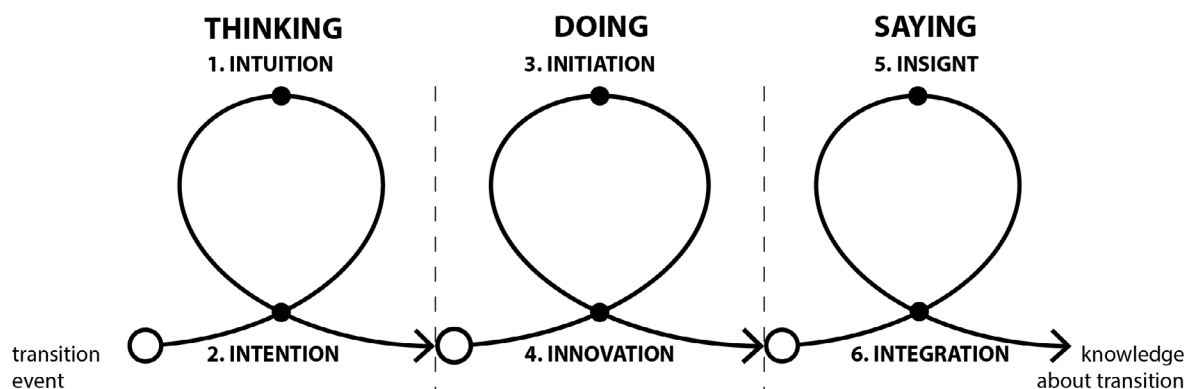
Figure 28
6IN knowledge-sharing loops
Source: by author

is represented through all three iterations moved from external triggers to individual intentions, to actual attempts to optimize the solution. The last loop is adaptation when the knowledge is becoming adaptation that became the new normal for the company and integrated into the company culture as part of the shared wisdom.

Checkpoints at the end of each cycle are critical knowledge-sharing points, essential for evaluating whether the process requires another loop or if it is mature enough, supported, and accepted by the organization to move to the next step (Figure 29). Each loop represents the process of knowledge conversion from tacit to explicit dimensions.

Additionally, it was observed that during every transition, additional opportunities appeared, and certain
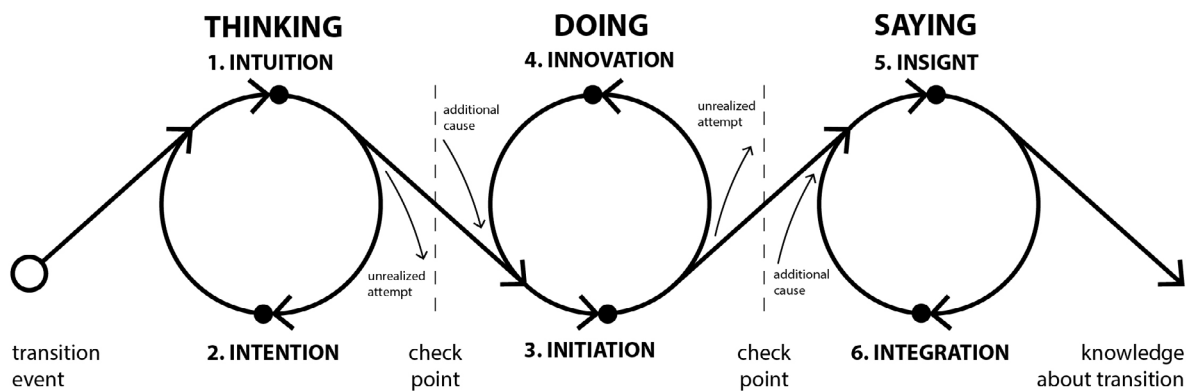
Figure 29
6IN model
Source: by author

processes or attempts were either dropped or remained looping or paused at one of the stages. For instance, this occurred with BIM integration for competitions (Interviewee 11, Interviewee 12), where some pilots were tested, but Rhino remains the primary 3D software for preliminary design stages.

4.5.4 6IN model

The following six knowledge-sharing coping tactics outline the results of empirical research, detailing the components and their sequence as drawn from the case study.

1. **INtuition**: Intuition is the first component of the model, representing the thinking dimension. It is an emotion-oriented coping tactic. This is characterized by an awareness of ongoing changes and curiosity, coupled with a reliance on one's gut feeling. In this research, intuition represents the socialization process of knowledge conversion.

2. **INtention**: Intention is the second component, also in the thinking dimension. It is an action-oriented coping tactic associated with an individual or group ambition to change. This involves observing potential opportunities and planning future steps. In this research, intention represents the externalization process of knowledge conversion.

3. **INitiation**: Initiation is the third component in the model and the first in the doing dimension. It is an emotion-oriented coping tactic. This is characterized by one's courage and proactivity in seizing opportunities in unknown environments. In this research, initiation represents the combination process of knowledge conversion.

4. **INnovation**: Innovation is the fourth component in the model and the second in the doing dimension. It is an action-oriented coping tactic, characterized by undertaking new actions, tasks, and processes, often within new teams or environments. In this research, innovation represents the internalization process of knowledge conversion.

5. **INsight**: Insight is the fifth component in the model and the first in the saying dimension. It is an emotion-oriented coping tactic. This involves individual and group reflection regarding the ongoing progress of transitional processes. In this research, insight represents the externalization process of knowledge conversion.

6. **INtegration**: Integration is the sixth component in the model and the second in the saying dimension. It is an action-oriented coping tactic. This is characterized by individual and group adaptation to newly acquired knowledge and its daily implementation. In this research, integration represents the internalization process of knowledge conversion.

4.5.5 6 IN model in transitional processes

This chapter will look at several transitional processes to undersand their current progress along 6IN model.

Complex projects

The transition of the office to develop more complex projects, driven by the availability of public projects in the market and integrated contract requirements, has brought along several separate transitional processes (Figure 30, Table 30).

a) Optioneering

Optioneering is a tool that allows users to follow specific project choices and clearly identify and navigate back and forth along the timeline when those choices were made (Interviewee 10). It is a powerful tool that addresses the needs of complex project development. It took a while to develop and test in academia before it became a documented artifact. However, although Optioneering is a powerful and helpful method, it is still used only within a specific project bubble and faces some cultural resistance from other project teams. That's why it is shown on the diagram at the level of integration.

b) Building Narrative

Building Narrative, as the third example of components along the complex project transitions, is currently between the innovation and initiation stages. It is mature enough as a method, having been tested in academia, yet it is still evolving as a living document at KAAN, where it is currently under development.
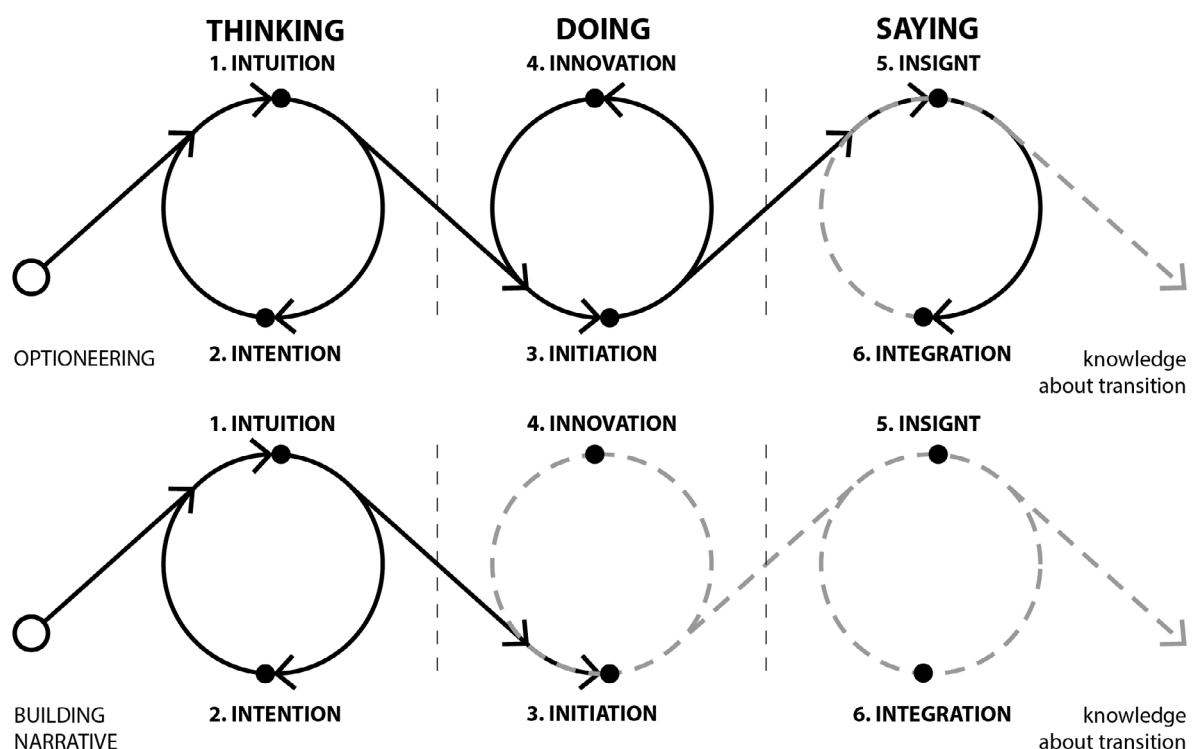
Figure 30.
6IN in project-complexity
Source: by author

Table 30.
6IN in project-complexity
Source: by author

Optioneering

1. Intuition	4. Innovation	5. Insignt
✓ complete	✓ complete	▷ ongoing
2. Intention	3. Initiation	6.Integation
✓ complete	✓ complete	▷ ongoing

Building Narrative

1. Intuition	4. Innovation	5. Insignt
✓ complete	▷ ongoing	-
2. Intention	3. Initiation	6.Integation
✓ complete	▷ ongoing	-

Circularity
a) impaKt

The most evident process for sustainability integration at KAAN is the development of impaKt, which has been developed in response to market demand for circularity. In the 6IN model, impaKt is currently between innovation(at the organizational level) and first elements of insight (at the individual level), as there are extensive discussions ongoing regarding its wider implementation, evolution, scalability, and measurability (Figure 31, Table 31).

THINKING — 1. INTUITION, 2. INTENTION
DOING — 4. INNOVATION, 3. INITIATION
SAYING — 5. INSIGNT, 6. INTEGRATION

impaKt

knowledge about transition
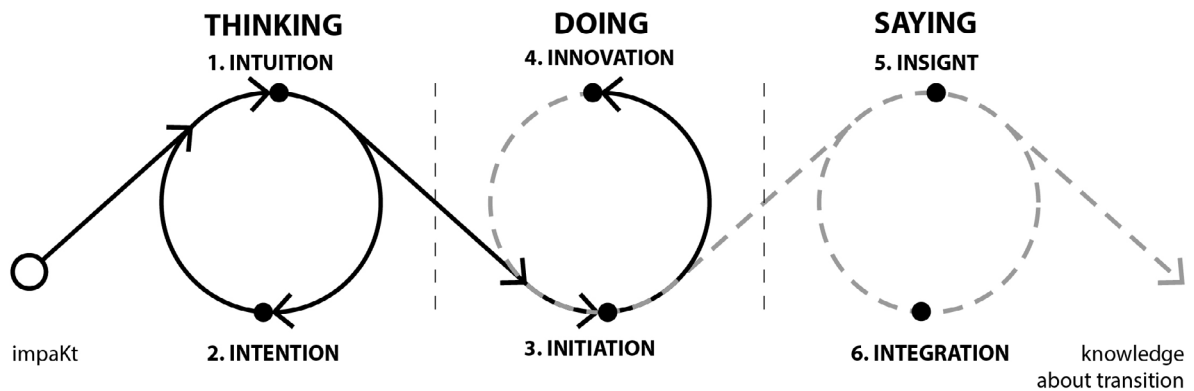
Figure 31.
6IN in circularity
Source: by author

Table 31.
6IN in circularity
Source: by author

impaKt

1. Intuition	4. Innovation	5. Insignt
✓ complete	↻ looping	-
2. Intention	3. Initiation	6.Integation
✓ complete	↻ looping	-

Digitalization

THINKING — 1. INTUITION, 2. INTENTION
DOING — 4. INNOVATION, 3. INITIATION
SAYING — 5. INSIGNT, 6. INTEGRATION

BIM

knowledge about transition

1. INTUITION, 2. INTENTION
4. INNOVATION, 3. INITIATION
5. INSIGNT, 6. INTEGRATION

AI INTEGRATION

knowledge about transition
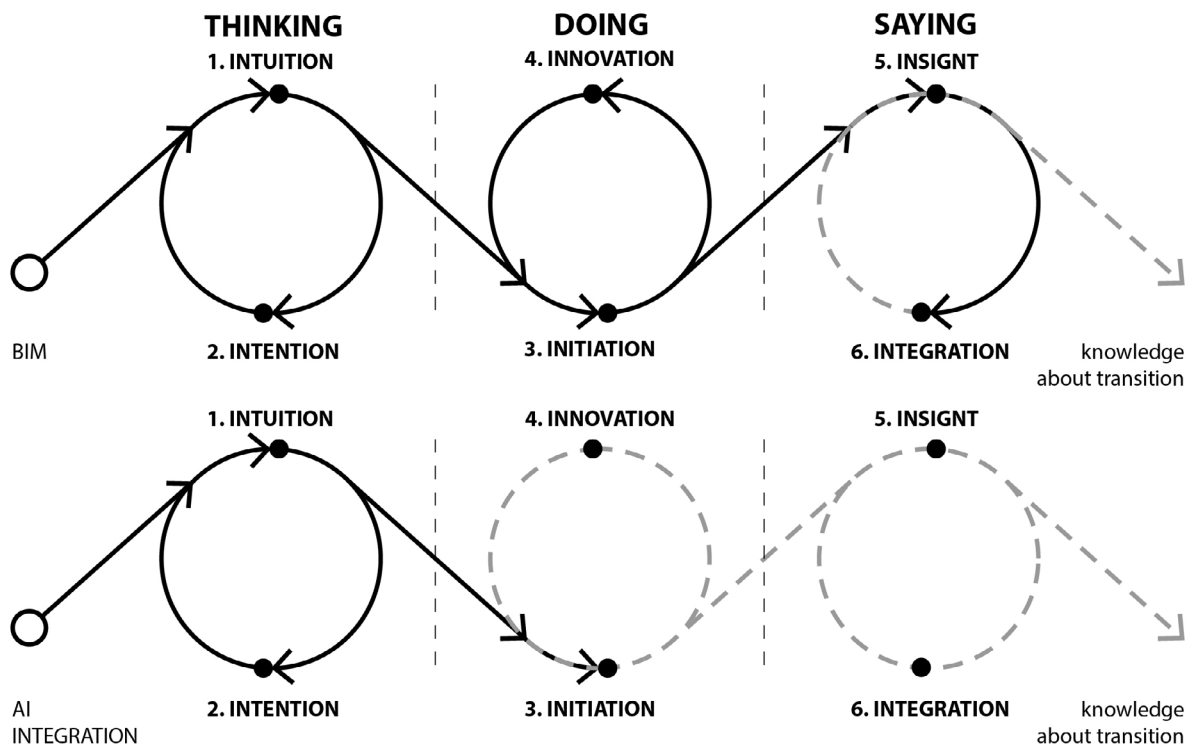
Figure 32.
6IN in digitalization
Source: by author

Table 32.
6IN in digitalization
Source: by author

BIM

1. Intuition	4. Innovation	5. Insignt
✓ complete	▷ ongoing	↻ looping
2. Intention	3. Initiation	6.Integation
✓ complete	▷ ongoing	↻ looping

AI

1. Intuition	4. Innovation	5. Insignt
↻ looping	▷ ongoing	-
2. Intention	3. Initiation	6.Integation
↻ looping	▷ ongoing	-

a) BIM implementation

First and foremost is the implementation of BIM, which serves as a procedural transition due to the mandatory Revit model submissions, as well as a technological transition since it requires learning new software and training employees for its successful integration. It also corresponds to an organizational transition as it neces-

sitates the creation of new roles (BIM captains), who are the experts on the topic and guide the entire office through this transition. Since BIM implementation was crucial for the company's participation in large public projects and the acquisition of new markets, it has always been driven both internally and externally. The implementation of BIM among several teams was sufficient to navigate the transition; however, it faced significant resistance from senior staff accustomed to CAD drafting and has not been fully implemented throughout the entire design process (most early stages are still developed in Rhino). As the diagram indicates (Figure 32, Table 32), the BIM process is currently at the stage of integration.

b) AI integration

AI integration as part of the daily routine is experiencing rapid growth, as it lacks major external triggers and requires significant time investment from the research team to test and develop custom tools applicable to KAAN's comprehensive design methodologies. Consequently, in the 6IN model, it revolves around the second circle, gradually accumulating progress and being tested in some pilot concepts by a few employees. This is true for both image generation and image post production processes.

From these examples, it can be observed that the process can already be fully proceed by certain individuals and a part of the daily routine of some teams and integrated into their culture after passing through the first two loops. Therefore the progress along the transitional processes differs for the individual, intra- and inter-organizational levels. However, adapting at the organizational level is crucial for transforming knowledge into common wisdom and embedding it within the office culture.

4.5.6 Conclusions on KSCT

RQ3: What **knowledge-sharing tactics** can be drawn to **cope with** ongoing and future **transitions** in architectural offices?

Based on the findings from a single nested case study, in which KAAN Architecten is taken as the unit of analysis, six components of knowledge-sharing tactics have been derived. These components are based on the analysis of transitional processes in the case study, namely *INtuition, INtention, INitiation, INnovation, INsight,* and *INtegration*, which together form the *6IN framework*. The model balances *task-oriented* tactics *(Intention, Innovation, and Integration)* with *emotion-oriented tactics (Intuition, Initiation, and Insight)*. The model is based on three iterative loops of *thinking (intuition, intention)*, *doing (initiation, innovation)*, and *saying (insight, integration)*. Each loop represents the process of knowledge conversion from tacit to explicit dimensions, with knowledge growing from individual to company wisdom. It is also concluded that although certain individuals can develop through all three loops, larger levels—from project teams to intra-organizational collaborations—require more time and effort.

DISCUSSION

DISCUSSION

This chapter aims to highlight the alignment and new insights between the theoretical review and empirical findings. It is structured according to the original sequence of the conceptual framework and the order of the research questions RQ1, RQ2, RQ3. Initially, the components of *'transitions'* are analyzed, and the dimension of future transitions is outlined. Subsequently, *'knowledge-sharing'* interactions in literature and practice are examined.

The discussion is further strengthened by the results of an internal workshop with research participants. During this workshop, participants were asked to evaluate the outcomes of cross-transitional and cross-interactional triggers, obstacles, and opportunities (Appendix F) through a Mentimeter survey, followed by a guided discussion to share their thoughts. Finally, based on the triangulated results between literature, empirical research, and the practical application, the implementation of knowledge-sharing coping tactics will be proposed at the inter-, intra-, and individual levels. This approach ensures a comprehensive understanding and application of the research findings across different levels (XS-XL) of the organizational structure.

5.1.1 Ongoing Transitions

Starting the research with academic knowledge of ongoing and future transitions in the built environment, the researcher expected to find strong dependencies of architectural offices on ongoing transitions in built environment, such as implementation of the Environmental and Planning Act (Government of the Netherlands, n.d.). However, surprisingly, in the case of KAAN, the office's ambitions to acquire new markets in order to build the most interesting projects go hand in hand with market and policy requirements for adaptation. Although the influence of external transitions on the company is more severe, it pushes the organization to act in entrepreneurial ways and to look for opportunities, which often leads to collaborations with new parties. As for internal transitions, which appear not only as responses to external factors but also as individual initiatives to influence transitions, they are also highly driven by acquiring new knowledge through self-learning and high-bandwidth communication.

Despite the obstacles faced during the transitions, such as resistance to change from some employees in the office, empirical research and further internal discussions show that individual and organizational ambitions serve as key opportunities to advance the organization. From this case study it seems sufficient if only some key players in the office believe in and support this change.

One of the biggest surprises was to find an alignment between KAAN's supportive approach to paradoxes (such as intentionally contradictory design features, a flat organizational structure for a medium-large architectural firm, and human resource efficiency and flexibility though multiple roles individuals play in the organization) and the transitional approach, which proposes dealing with paradoxes not as issues to be resolved (Amado & Ambrose, 2018), but rather as elements to be balanced and optimized.

5.1.2 Future Transitions

Discussing future external transitions and considering some main future trends that the built environment will have to face, namely *climate change, resource scarcity, focus on health, urbanization*, and changes in *population* (Thelen, 2019), architects will have to navigate these changes through professional evolution. KAAN Architecten has already begun taking steps to acquire the healthcare market for future portfolio diversification (personal observations), as well as considering how to interconnect an even higher number of stakeholders, possibly through scaling up the principles of Building Narrative and custom digitalization such as AI. At the same time, collaboration with an even more diverse range of actors to enhance circularity integration in the office is also a point for discussion.

As for internal office transitions, one of the most notable findings has been the identification of possible scenarios for office organizational development, as outlined by the management team (Interviewee 3). The current project-bubble system provides sufficient variety and flexibility within the office organization while still maintaining a high degree of interconnectivity. This system is quite unique compared to other architectural offices, which typically exhibit a clear top-down structure with a single centralized core and random team formations, more common in smaller organizations (Figure 33). Alternatively, in larger organizational structures, each partner often has their own fixed team and possibly a distinct design approach, while finance, IT, and HR functions may still be shared. Therefore, it remains an open question whether, in 10 years, KAAN will become more interconnected as employees progress in their careers and move closer to the organizational center, or whether the opposite will occur, with each project-bubble developing more as an independent entity capable of acting autonomously (Figure 34).
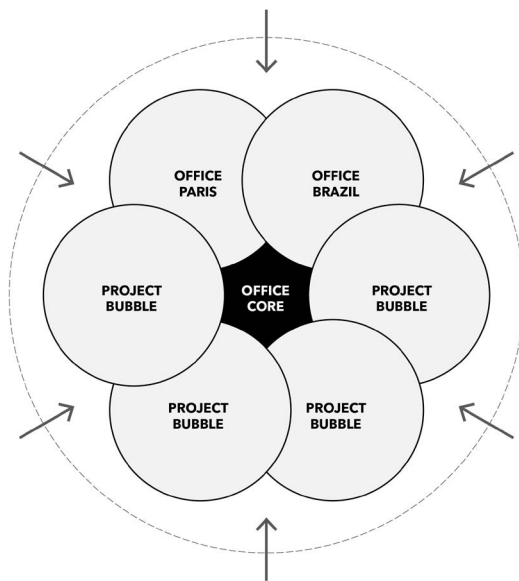
Figure 33.
Future organizational transition. Moving closer to center
Source: by author
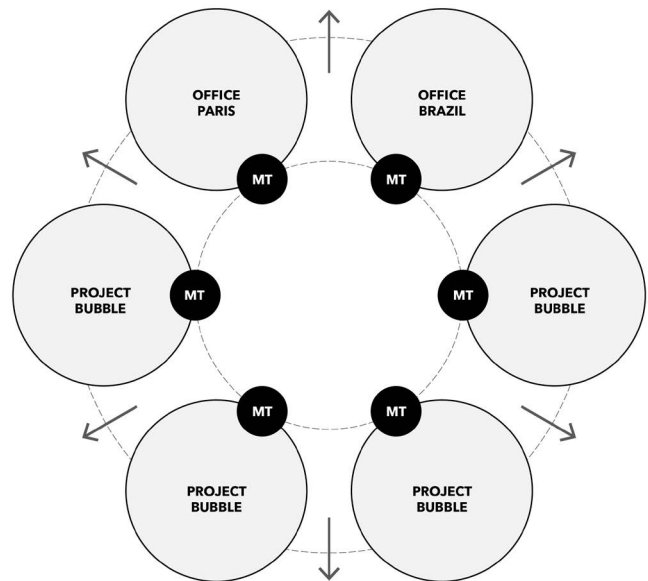
Figure 34.
Independent project bubbles
Source: by author

5.2.1 Knowledge-sharing and socio-technical perspective

Considering the position of KAAN Architecten within Winch's categorization an surprising outcome has emerged. It was originally assumed that KAAN, like many Amsterdam-Rotterdam-based architectural firms, would fall under the category of the strong-idea type. However, empirical research revealed that it actually spans all four categories: *strong delivery, strong experience, strong ambition*, and *strong ideas.* The first category is evident through KAAN's atypical scope of service for a Dutch architectural firm, which includes the full construction cycle from concept to realization and partnerships with DBFMO structures. The second category is demonstrated through strong technical expertise and a focus on quality, as well as an impressive portfolio of public projects. The third category is realized in KAAN's ambition to acquire new markets and expand the project portfolio from social housing to large public buildings. The fourth category, discernible through the framing-typology-geometry-craft manifesto, brings aesthetically defined and poetical buildings, which interconnect architecture with art throughout project development.

Regarding the company's position between *HRM* and *IT* knowledge-sharing strategies, another surprise was found. It is peculiar that KAAN achieves both artistic competency and a strong product portfolio, evident through refined design. However, the approach to HRM and IT strategies differs from the traditional top-down approach. The transfer of tacit knowledge, achieved through a common background (such as the Complex Projects Studio) and implemented methods like Optioneering, develops employees mindset to sharpen their minds and think critically, rather than providing a specific set of essential skills. At the same time, the diversification and specialization of employees provide essential complementary skills, which still allow ample room and opportunities for team formation but also ensure resource efficiency and flexibility for the company without establishing a strictly controlled centralized system with fixed organizational roles. As for the IT focus, as interviewees stated, it is just a tool serving a larger purpose to deliver high-quality architecture; however, in KAAN's case, this tool needs to be customized to be able to express the design. Therefore, a socio-technical perspective needs to indicate additional perspectives to be applicable to KAAN's organizational structure and the case study. In fact the primary focus on *"project"* can position the organization within the *6 P's framework (Project, Product, Profit, Process, People, Policy)* (AR2MBE025_CourseBook_2023, 2023).

5.2.2 Knowledge-sharing in Transitional Processes and 6P

A strong correlation has been found between the *6 P's framework (Project, Product, Profit, Process, People, Policy)* (AR2MBE025_CourseBook_2023, 2023) and the proposed model of the transitions. As every transition aims to lean towards a particular set of values, each dimension has a different perspective. Therefore, economic and organizational transitions lean towards profit, behavioral and societal transitions towards people, procedural transitions depend on policies, project approaches depend on policies, while sustainable transitions look for a particular product and technological transitions aim to optimize the process dimension through different tools (Figure 35).
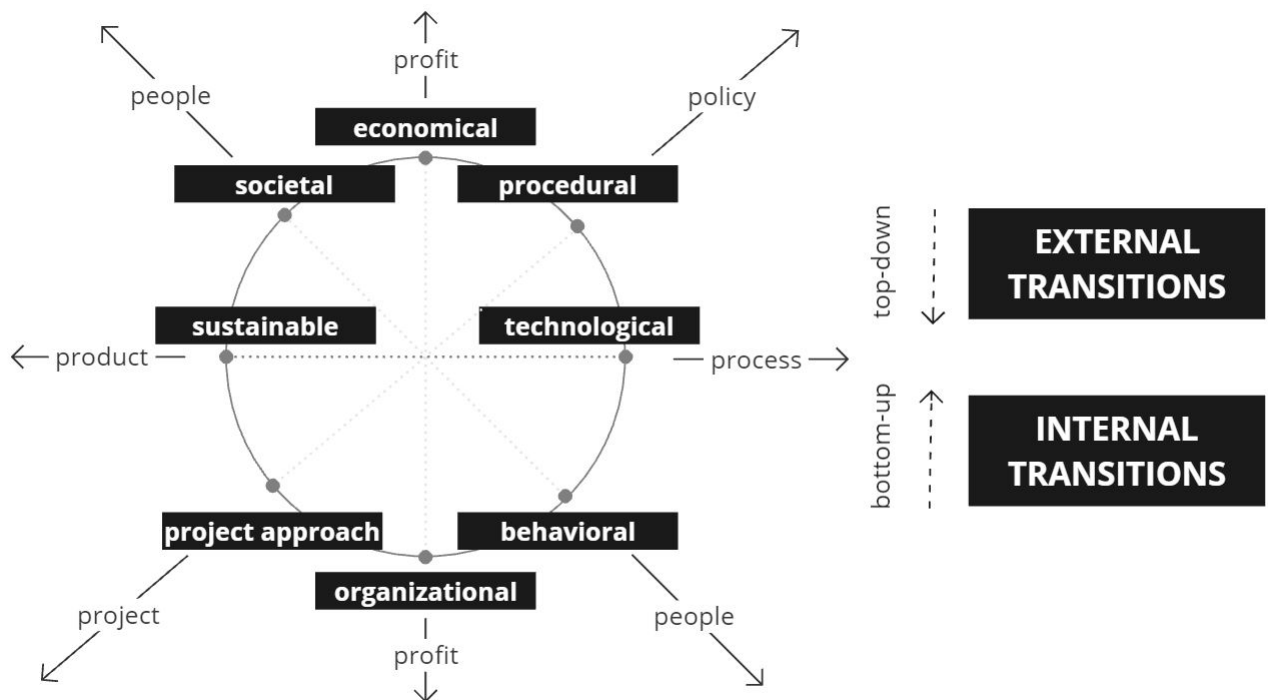
Figure 35
Transitions and 6P perspective
Source: by author (based on: AR2MBE025_CourseBook_2023)

Figure 36 shows the example of technological transition through BIM process implementation, which aligns with the interests of policies in DBFMO contracts, but is not entirely applicable for the organization, as it can be beneficial for large public projects but slow down design flexibility in earlier stages or be unnecessary for smaller private projects. The similar applies for *'people'* dimension, where BIM captains as experts in the topic support the integration of BIM in the organization, which aligns with the ambitions of younger generations who are open to learning new software, and conflicts with the values of some project leaders who are accustomed to different approaches to software and working methodology (Figure 36).
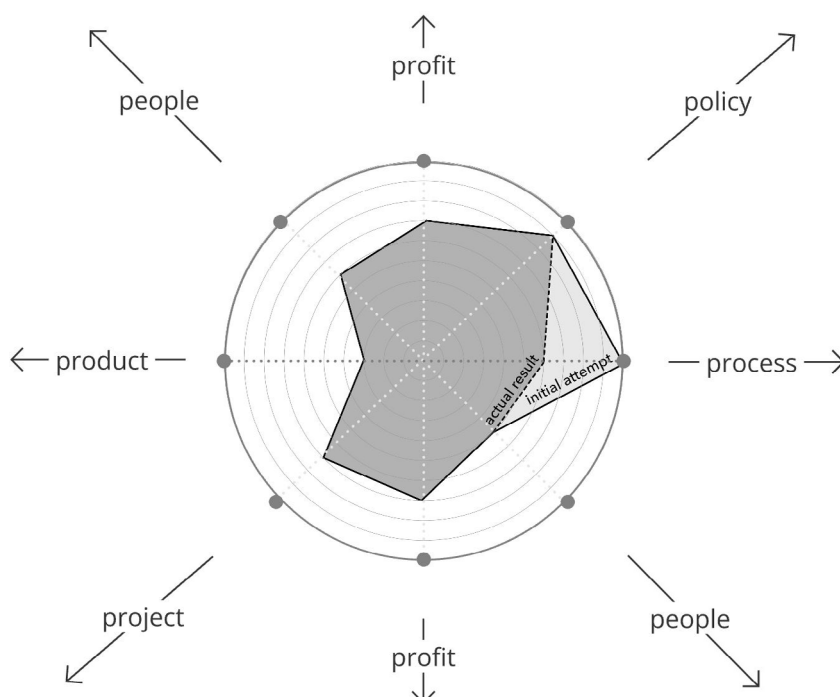
Figure 36
Transitions and 6P perspective. BIM example
Source: by author

Following Section 4.4.5, Table 33 is transformed from transitions to values according to the 6 P's model. It can be seen that every transition involves clashing opinions, as different stakeholders support or reject certain changes. Therefore, it is important to understand which tactics are useful to implement in order to find common ground through knowledge-sharing and proceed along the transition.

Example	Primary Cause	Secondary Cause	Maybe in conflict with
Social Practice			
Atelier paradox	*profit*	*project, policy, people*	*other people*
Tool			
BIM (Revit)	*process*	*policy, project, profit, people*	*other project, people*
Enscape	*process*	*project, people*	*other people*
AI BIM-Enscape-AI	*process*	*project, people*	*other project, other people*
Artifact			
impaKt	*product*	*policy, project, people, process, profit*	*other project, other people*
Optioneering, Building Narrative, Competition & Kick-off booklet	*project*	*policy, people, profit*	*process, other people, other project*
Context			
Complex projects studio	*project*	*profit, people*	*other people*
Long term projects	*project*	*profit, people, process*	*other process, other people*

Table 33.
Knowledge sharing transitional processes and primary,
secondary and conflicting causes in 6P system
Source: by author

5.3 Discussion knowledge-sharing coping tactics

As for the knowledge-sharing coping tactics, as they has been defined though a single case study, more data should be gathered regarding different architectural firms to optimize and confirm the selection. While the sequence of the tactics is not universal, as can be seen from the literature review, the **traditional mode** of organizational learning follows the order of **thinking-saying-doing**, which is suitable for **top-down** hierarchical organizational structures. The non-conventional approach following Engeström's (2001) **expansive learning** model proposes the sequence of **doing-thinking-saying** to enhance **bottom-up** initiatives. It is also assumed that other variations are possible and suitable for particular companies and situations. The current research, however, indicates the logic of **thinking-doing-saying**, suitable in a situation similar to the *"atelier paradox,"* which allows the interconnection between more dominant **top-middle-bottom, top-bottom-middle**, and **middle-bottom-up** approaches.

Considering the process of evaluating how applicable the proposed framework is to KAAN, other architectural offices, and how much it can be generalized, the following results were collected from the internal workshop discussion. The workshop participants believe that the framework is quite applicable to KAAN, scoring it 3.3 out of 5. However, it might be difficult to apply to other architectural offices, with a score of 2.6 out of 5. Regarding industry application, opinions among participants were divided. Some believed that the proposed model for instance is applicable to entrepreneurial businesses, with an overall score of 3.2 out of 5 (Figure 37).

Figure 37.
Mentimeter wider application
Source: by author
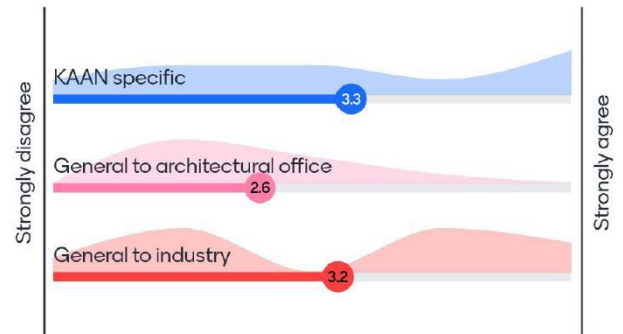
Considering the knowledge-sharing coping tactics and their sequence, which workshop participants have been also asked to evaluate, the following outcome has been found. During the workshop, participants were asked to evaluate the proposed sequence and the components themselves. Several supporting arguments were found for the proposed framework. First, the dialog, triggered by the question of one of the Project Leaders to the partners and management team concerned the company's vision, top-down translation of values, and justification of project choices. The response highlighted that the office often needs to act intuitively and make various attempts to find a suitable strategy that works, requiring support, open-mindedness, and the ambition of employees to try new things. This dialogue supports the proposed sequence, underlining that from the thinking step, the office moves to doing, and then to saying afterwards.

'Yes, applicable but also important to take into account the variety of ambition and values in different people which translates into different levels of engagement' (quote from Mentimeter survey)

A second supportive argument for the framework came from one of the Management team members, who referred to the development of impaKt as following the exact process the framework proposes.

'If you take impaKt, let's say, you came from Brazil with the intention of hammering office with sustainability, and then with your intuition that we need a think-tank, a group of people that will think of it, then you initiate that and we started sitting, started developing a tool, that it was initiation, than we came to the conclusion that in order to have that we have to have the process of innovation, which were about developing some tools etc, which we started integrating into the project, and we ended up with the first element of insight…'. [I5 to I2 during the internal discussion workshop]

At the same time, workshop participants suggested switching the order to place **'intuition'** before **'intention,'** which was implemented in the version described in Chapter 4. They also referred to an additional 'IN' in the process, such as **'INspiration,'** and found similarities in the model to the **Plan, Do, Check, Act (PDCA) model** (Deming, 1982), which helps them find rational solutions, for instance in Business Development. The importance of checkpoints was also highlighted, which can be termed **'INspection'.**

'Proactively alternating the perspective on topics is missing, call it inspection or interrogation' (quote from Mentimeter survey)

5.3.1 Cross-level 6IN model application

The following section describes how the model of 6IN can be applicable in other organizations on individual, intra-organizational, and inter-organizational levels.

Individual Level (Figure 38)

1. **INtuition:** Architects utilize their intuition to flexibly manage risks and adapt to design demands, enhancing creativity through an entrepreneurial approach that leverages their personal insights.

2. **INtention:** At the individual level, personal career goals and inter-team dynamics drive the ambition to learn from experienced colleagues, engage in mentoring, and actively participate in hands-on experiences that are pivotal for professional growth.

3. **INitiation:** Embracing new opportunities for personal growth, learning from mistakes, and developing new competencies are initiated by individuals seeking to enhance their capabilities.

4. **INnovation:** Encourages individuals to innovate by continuously learning and improving and doing new tasks, which they have never done before, applying their unique strengths to creative problem-solving within their projects.

5. **INsight:** Individuals gain valuable insights into their strengths and weaknesses, which improves their ability to delegate tasks effectively and intervene strategically to optimize project outcomes.

6. **INtegration:** Focuses on the integration of new skills and knowledge into daily practice, which is crucial for individuals to adapt to changing project requirements and enhance their performance.
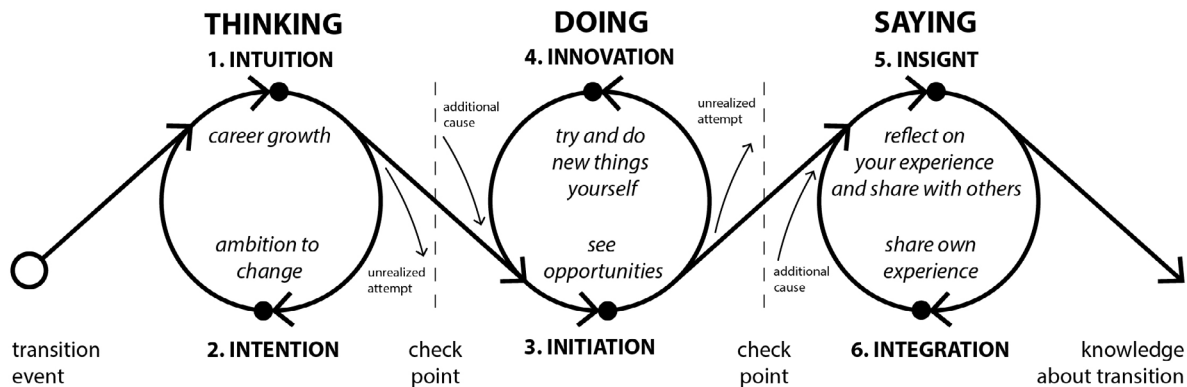
Figure 38.
6IN individual level application
Source: by author

Intra-Organizational Level (Figure 39)

1. **INtuition:** Guides the development of new collaborations and the integration of advanced tools like BIM and AI, fostering a culture of innovation.

2. **INtention:** Enhancing network connections within the organization and learning new types of collaborations are crucial for acquiring new markets and diversifying the firm's activities.

3. **INitiation:** Supports the initiation of new technologies and methodologies within the organization, promoting a culture that values learning and adaptation.

4. **INnovation:** Fosters a supportive environment where innovative ideas can flourish, enhancing the firm's internal capabilities and project outcomes.

5. **INsight:** Insights into team dynamics and project management strategies improve internal processes and communication, fostering a more cohesive and efficient organizational culture.

6. **INtegration:** Strengthens internal networks and enhances team collaboration, which is crucial for the effective integration of new markets and technologies into the firm's operations.
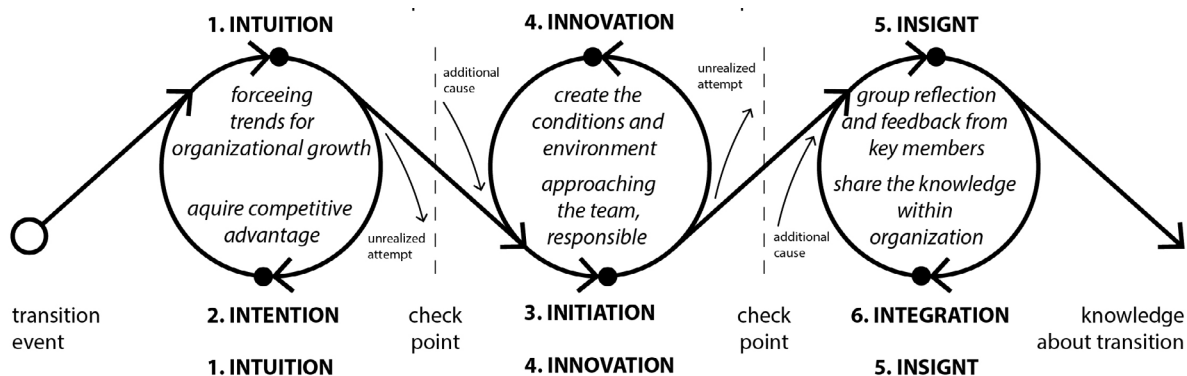
Figure 39.
6IN intra-organizational level application
Source: by author

Inter-Organizational Level (Figure 40)

1. **INtuition:** Helps in anticipating market trends and technological advancements, supporting strategic decisions that align with the office's long-term vision.

2. **INtention:** The long-term vision and proactive approach to market fluctuations drive the office to learn and adapt, which enhances portfolio development and strategic market responsiveness.

3. **INitiation:** Initiating new business ventures and strategic partnerships reflects the office's adaptability to market changes and its vision for future growth.

4. **INnovation:** Involves adopting new technologies and methodologies that keep the firm competitive and responsive to industry advancements and client demands.

5. **INsight:** Strategic insights from market analysis and project experiences guide decisions, supporting sustainable and innovative project outcomes that align with business goals.

6. **INtegration:** Effective integration of strategic visions into project management and design practices aligns long-term goals with daily activities, enhancing overall business performance.
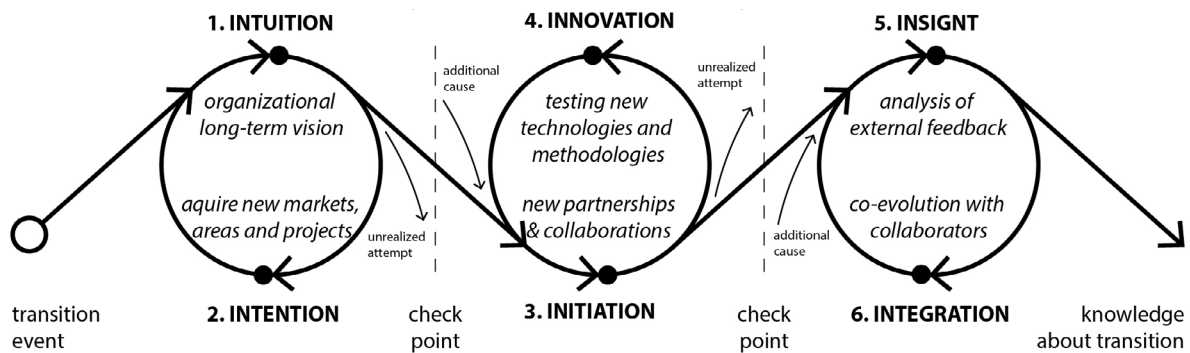
Figure 40.
6IN inter-organizational level application
Source: by author

In the conclusion section, people management practices accumulated from the literature review will be given as recommendations at the individual, intra-organizational, and inter-organizational levels.

CONCLUSIONS

How does knowledge-sharing help architects cope with ongoing and future transitions?

To answer this question, a series of overarching sub-questions (SQ) have been answered:

RQ 1: What are the ongoing transitions experienced by architectural practices?

RQ 2: How does knowledge sharing influence ongoing transitional processes in architectural practices?

RQ 3: What knowledge-sharing tactics can be drawn to cope with ongoing and future transitions in architectural offices?

CONCLUSION

RQ 1: What are the ongoing transitions experienced by architectural practices?

This research question aimed to understand the ongoing transitions experienced by architectural practices from the theoretical review, to explore this domain in empirical settings, and finally to evaluate the outcome, indicated in Figure 25 and Figure 35.

In specific sectors, such as Dutch architectural firms, *transitions* can be observed through various lenses, including sustainability, technology, and organizational structure. The proposed framework categorizes transitions in architectural practices into *external* and *internal* types, encompassing dimensions such as *project approach, organizational* and *behavioral* aspects for internal transitions, and *societal, economic*, and *procedural* aspects for external transitions. *Sustainable* and *technological* transitions can occur at both internal and external levels.

External transitions are primarily driven from the *top-down*, meaning architectural companies often react to global changes. However, the ambitions of an office can define the niche that architectural practices can acquire through a proactive approach. External/Internal transitions within the company are more *bottom-up* driven (from company to market) until the requirements become mandatory (or mandatory for certain projects). Therefore, the company can choose whether to invest time and effort in specific specializations. Internal transitions within an architectural company can be driven top-down or through bottom-up initiatives supported by the company.

This case study demonstrates the interconnectedness of transitions, where certain features can be the triggers of one transition but also serve as examples, opportunities, or obstacles for others. For example, *'integrated contact'* can drive behavioral, organizational, project approach, and technological transitions while also being an example of economic transition and an opportunity for procedural transition. The research indicates that *'global events'* are the primary drivers of these transitions, leading to the current transitional processes observed in the case study. These processes represent the steps taken by the organization to respond to ongoing transitions.

RQ 2: How does knowledge sharing influence ongoing transitional processes in architectural practices?

This research question aimed to understand the influence of knowledge-sharing on ongoing transitional processes experienced by architectural practices from the theoretical review, to explore this domain in empirical settings, and finally to draw the outcome, indicated in Table 26.

In this research, *knowledge-sharing*, as part of knowledge management, is proposed to be presented in four dimensions through the knowledge diamond framework (Bektas, 2013): *social practices* (actor-actor, actor-group interactions), *artifacts* (actor-artifact interaction), *tools* (actor-tool, actor-AI interactions), and *context* (group-context interactions).

Although daily knowledge-sharing interactions may appear within a single dimension, transitional processes, even when assigned to a specific dimension, typically require support from other dimensions. The features of transitional processes can span multiple transitions and dimensions of interaction. While they may be triggered by specific transitions, obstacles or contradictory transitions are inevitable along the way.

During the analysis of transitional processes, a strong correlation has been found between the *6 P's framework (Project, Product, Profit, Process, People, Policy)* (AR2MBE025_CourseBook_2023). Each transition aims to align with particular values, with each dimension offering a different perspective. *Economic* and *organizational* transitions lean towards *profit*, *behavioral* and *societal* transitions towards *people*, *procedural* transitions depend on *policies*, *project* approaches rely on *projects*, *sustainable* transitions focus on specific *products*, and *technological* transitions aim to optimize the *process* dimension through various tools. Every transitional process involves conflicting opinions, as different stakeholders support or oppose certain changes. Therefore, understanding which tactics are effective for finding common ground through knowledge-sharing is crucial for progressing through the transition.

RQ 3: What knowledge-sharing tactics can be drawn to cope with ongoing and future transitions in architectural offices?

This research question aimed to understand the approach to *knowledge-sharing coping tactics*, suitable for

architectural practices from the theoretical review, to examine this domain in empirical settings, and finally to draw the outcome, indicated in Figure 29.

A comprehensive framework that addresses **inter-, intra-,** and **individual** organizational levels has been proposed to tackle the complexity of the subject from a socio-technical perspective.

Based on findings from a single nested case study, where KAAN Architecten is analyzed, six components of knowledge-sharing tactics have been derived. These components, based on the analysis of transitional processes in the case study, are **intuition, intention, initiation, innovation, insight**, and **integration,** forming the **6IN** conceptual model. This model balances task-oriented tactics (Intention, Innovation, and Integration) with emotion-oriented tactics (Intuition, Initiation, and Insight). The model is based on three iterative loops of **thinking (intuition, intention)**, **doing (initiation, innovation)**, and **saying (insight, integration)**. Each loop represents the process of converting knowledge from tacit to explicit dimensions, with knowledge evolving from individual to company wisdom. It is also concluded that while certain individuals can develop through all three loops, larger groups—from project teams to intra-organizational collaborations—require more time and effort.

The sequence of tactics is not universal. As seen from the literature review, the **traditional mode** of organizational learning follows the order of **thinking-saying-doing**, which suits top-down hierarchical structures. Engeström's (2001) **expansive learning** model proposes the sequence of **doing-thinking-saying** aligned with **bottom-up** approach. Other variations may be possible and suitable for specific companies and situations. However, the current research indicates that the logic of **thinking-doing-saying** is suitable in situations similar to the **"atelier paradox,"** allowing interconnections between more dominant **top-middle-bottom, top-bottom-middle**, and **middle-bottom-up** approaches.

Main research question: How does knowledge-sharing help architects cope with ongoing and future transitions?

Based on the answer to the previous sub-questions, to cope with future transitions, a sequence of recommendations has been proposed. The evaluation of **'people management practices'** (Figure 16, Appendix F) discussed in the literature review, can enhance the **6IN model** and boost **knowledge-sharing coping tactics.** The recommendations, outlined in Table 34, align with the sequence of the 6IN model, namely thinking-doing-sharing, and reflect on people management practices at three levels: **individual, organizational,** and **inter-organizational.** It is evident that boosting only a single dimension of the knowledge diamond is insufficient; instead, people management practices should be strategically approached through all four dimensions.

The following table highlights the importance of items such as **'Culture of caring (trust and cooperation)',** **'Perceived support', 'Person – organization fit', 'Communities of practice',** and **'Interdependency',** which are present at every level and stage in the sequence. The unique practices, namely **'Site Visit Programme', 'Teams/ cross-functional teams', 'Reward knowledge-sharing behaviors'**, and **'Developmental evaluations',** can strategically enhance specific actions. Additionally, processes such as the Intranet and **E-Library**, which grow in scale from individual to inter-organizational levels, demonstrate how different tools can address multiple needs.

By implementing these recommendations, architectural practices can manage ongoing and future transitions at individual, intra-organizational, and inter-organizational levels through knowledge-sharing tactics, augmented by people management practices.

Table 34.
People management practices as enhancement measurments to KSCT, classified by knowledge-sharing perspectives
Source: by author

	THINKING	DOING	SAYING
Individual			
social practices	Culture of caring (trust and cooperation) Perceived support Coaching and Mentoring Person – organization fit Communities of practice Interdependency	Culture of caring (trust and cooperation) Perceived support Coaching and Mentoring Person – organization fit Communities of practice Interdependency High band-width communication	Culture of caring (trust and cooperation) Perceived support Coaching and Mentoring Person – organization fit Communities of practice Interdependency High band-width communication
tools	Intranet and E-Library Training to use technology	Technology chosen to fit culture User-friendly information technology	User-friendly information technology
artifacts	Extensive training	Extensive training Informal Knowledge Workshops	Extensive training Formalized orientation and socialization programmes
context		Talk Space Space for face-to-face communication	Talk Space Space for face-to-face communication
Intra-organizational			
social practices	Culture of caring (trust and cooperation) Interdependency Person – organization fit Perceived support Communities of practice Employee referrals Communities of practice Knowledge teams	Culture of caring (trust and cooperation) Interdependency Person – organization fit Perceived support High band-width communication Coaching and Mentoring Communities of practice Team-based/cross-training Formalized orientation and socialization programmes Communication skills Knowledge teams	Culture of caring (trust and cooperation) Interdependency Person – organization fit Perceived support High band-width communication Coaching and Mentoring Knowledge-sharing norms Knowledge teams
tools		User-friendly information technology Technology to enhance existing social networks Technology chosen to fit culture Intranet and E-Library	User-friendly information technology Technology to enhance existing social networks
artifacts	Informal Knowledge Workshops Knowledge Exchange Seminars Departmental Meetings	Extensive training Team-based/cross-training Formalized orientation and socialization programmes	Reward knowledge-sharing behaviours Developmental evaluations Informal Knowledge Workshops Knowledge Exchange Seminars Departmental Meetings
context	Site Visit Programme	Talk Space Space for face-to-face communication Co-location	Talk Space Space for face-to-face communication Co-location
Inter-organizational			
social practices	Culture of caring (trust and cooperation) Perceived support Communities of practice Knowledge teams Interdependency Person – organization fit Employee referrals	Culture of caring (trust and cooperation) Perceived support Communities of practice Knowledge teams Interdependency Person – organization fit Knowledge-sharing norms High band-width communication Teams/cross-functional teams Communication skills	Culture of caring (trust and cooperation) Perceived support Communities of practice Knowledge teams Interdependency Person – organization fit Knowledge-sharing norms Communication skills
tools		Technology chosen to fit culture Technology to enhance existing social networks	User-friendly information technology Intranet and E-Library
artifacts		Informal Knowledge Workshops Knowledge Exchange Seminars	Summary Reports
context		Talk Space Space for face-to-face communication Co-location	Talk Space Space for face-to-face communication Co-location

LIMITATIONS & FURTHER RESEARCH

1. Personal Bias and Subjective Interpretation:

Given that all data was collected and analyzed by a single researcher, future studies should involve multiple analysts to minimize personal bias and ensure a more objective interpretation of the data. This approach can help diversify the analytical perspectives and provide a more balanced analysis of the data.

2. Limited Data Collection Scope:

The study focused exclusively on KAAN Architecten, which as this study shows, represents unique organizational structure, therefore it is difficult to generalize this example to other architectural offices.. To enhance the scalability of the research findings, subsequent studies should include a variety of architectural firms, encompassing different entrepreneurial models and organizational structures. This would provide a more comprehensive understanding of the applicability of the findings across the sector.

3. Limited Perspective on Collaboration:

The research included interviews with a very few of KAAN Architecten's external collaborators, limiting the perspective on collaboration. Future research should expand the pool of interviewees to include a broader range of external partners. This would enrich the findings and provide a deeper insight into collaborative practices within the architectural industry.

4. Internal Validation of Results:

The results of the research were primarily validated internally, without extensive external verification. To broaden the validation and strengthen the credibility of the findings, future studies should incorporate external interviews and workshops. Engaging a wider array of stakeholders in the validation process would help in critically assessing the research outcomes and in identifying additional areas for improvement.

5. Measurability and Applicability of the Framework:

The research relies on qualitative, subjective parameters, which may impact its measurability and broader applicability. Future studies should focus on developing and integrating Key Performance Indicators (KPIs) to enhance the framework's measurability. A comprehensive KPI system would make the outcomes more quantifiable and actionable, allowing for a more rigorous assessment of the 6IN model's effectiveness across different contexts.

6. Applicability to Different Architectural Contexts:

The applicability of the 6IN model to other actors in the built environment, particularly in architectural studios of different sizes and scopes, remains untested. Further research should test the model across various types of architectural offices and additional stakeholders to evaluate the model's general applicability and effectiveness in managing transitions. This would help determine how 6IN framework can be customized to fit different organizational environments and transition challenges.

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INTERVIEW PROTOCOL

Interview protocol
Management in Built Environment
Graduation Laboratory 2023/2024
Olga Surogina
Organization: KAAN Architecten
Interviewee name: [Name]

The interview begins with a formal introduction of the thesis study, the interview purpose, and an explanation of the context. Permission for interview recording should be granted. The signed informed consent form should be collected before the interview starts, the form should be sent to participants in advance to have time to read it thoroughly. The interview has 4 parts, the first one is about the participant's background information, while the other 3 parts are directly looking for the answers to the research subquestions 1,2, and 3. The interview will be further transcribed for further analysis and checking. At the same time, the audio recording will be kept during the processing period.

Purpose of the interview: Understanding ongoing transitions in architectural offices, and methods of how architectural practice as an organization, project teams, and people can cope with those transitions through knowledge-sharing.

Introduction
Hello, nice to meet you, and thank you for accepting the invitation for this interview. I work part-time for KAAN Architecten as a PR & Communication officer and at the same time, I do my graduation research here as a student of the Master Program of Management in Built Environment at TU Delft. Therefore, Kees Kaan is my second mentor and KAAN Architecten is my research case study. This interview is a part of my master's thesis research project. It is about how architects are coping with ongoing transitions in the Built Environment through knowledge-sharing.

Before we begin, there are a few formalities that we need to settle. The first one concerns the signed consent form, I will need it before starting the interview. Second, I would like to ask your permission to record this interview to facilitate the transcription process, which will serve for further analysis. The information here will remain confidential and we may stop the interview at any time if you feel uncomfortable. If required, you can ask to not include and revise your responses, even after the interview. In case certain questions or definitions will not be clear to you, please feel free to ask for clarifications.

This interview is planned to be no longer than one hour. During this time, I have several questions that I would like to cover. I will let you know if the time begins to run short, then you can choose either to wrap up certain answers and continue with further questions or if you would prefer to extend the timing of the interview.

Questions. Generic questions (to be adapted for each role)
Background / Context (10 min)
• Can you please introduce yourself and tell a bit about your role in KAAN Architecten?
Prompts:
-possibly ask additional questions regarding the role at organizational, team, and community levels

Transitions [Frame 1] (15 min)
First of all, I would like to ask you several questions about ongoing transitions in KAAN Architecten. By transitions, this research means the current changes which are still in progress.
• There are several recent transitinons, which happened in KAAAN Architecten, such as BIM implementation, impaKt (sustainability guide), new approach for Building Blocks (knowledge-sharing presentations), remote working policies after Covid, updated system of working performance apprisal or KAArbon (carbon emission assessment tool). Could you tell your experience about some of those?
• From where this transition [name it] came from?
Prompts:
-look for whether it is an internal or external process
• How this transition [name it] has been implemented in the office?
• How do this transition[name it] was accepted by you personally/ the project team you are working with / the organization itself?
Prompts:

-look for feelings / coping mechnisms
- How do this transition[name it] affect you personally/ the project team you are working with / the organization itself?
- How do you think what were the trigger and consequences of this transition [name it] and what trigger it to happen in KAAN?

Prompts:
-look for procedural / human factor / context criterias for the framework
- Could you also name the other important transition which is recently happening or may happen in a near future?

Prompts:
-not all the questions necessarily need to be asked in this list, the participant's story should be naturally guided through them, and the order of questions is free.
-looking for internal/external transitions, inc. environmental, technological, economic, political, behavioral, and societal changes

Knowledge-sharing [Frame 2] (15 min)
Now, I would like to ask several questions on how the knowledge from those transitions happening in KAAN Architecten shared in the office.
- For this transition [name it] how the knowledge was shared in KAAN Architecten?
- What did you learn from your colleagues? What kind of knowledge did you share with your colleagues? How did you do that?

Prompts:
-look for procedural / human factor / context criterias for the framework
- How did you experience this transition [name it]? What were your feelings? What were your actions?

Prompts:
-draw some associations between how KAAN colleagues live through and feel about the changes WITH how they dealt with these in their 'doing' (i.e. coping)

Coping Tactics [Frame 3] (15 min)
- Which aspects do you find important when people are trying to pass the new knowledge from one to another? What are the challenges?
- What do you think could help KAAN Architecten to enhance this process?
- From your previous experience, what are the action steps that the project team (organization) is taking when they face completely new requirements?

Prompts:
-to make the question more specific, "as the organization/ within a project team/ in the community" can be added, in consideration of the role, the interviewee plays in the office.
-can ask what interviewee found a proper knowledge-sharing environment
-looking for approaches, coping mechanisms, enhancement techniques

Conclusion
I would like to thank you for the interview, and for sharing your valuable thoughts and ideas. This research will be presented at the end of June at TU Delft, and you are very welcome to join my graduation presentation. In case you will have some further thoughts on this topic, please feel free to contact me.

INFORMED CONSENT LETTER. INTERVIEWS

Informed Consent Letter
Rotterdam, __/__/____
Reference: Inform consent to participate in research "Knowledge about transitions".

Dear Sir or Madame,

You are invited to participate in a master's thesis research study titled "Knowledge about transitions". This study is conducted by Olga Surogina, a student from TU Delft, who is doing graduation research at KAAN Architecten.

The purpose of this research is to understand the current ongoing transitions, which affect architectural offices and to propose knowledge-sharing tactics, that architects can use at the organizational, project team, and community levels to cope with those transitions. The interview will take approximately 60 minutes to complete. During the interview, you will be asked about the recent ongoing changes, triggerd by external factors, you've been noticing in the office and the ways you, your team, and KAAN Architecten as an organization are dealing with them.

As with any online activity, the risk of a breach is always possible. To the best of my ability, your answers in this study will remain confidential. I will minimize any risks by:

Safely storing your personal data in a designated project drive. Upon completion of this research, your name and contact names will be deleted.

All processed data will be anonymized by removing direct identifiers linked to your name.

Interview recordings will be deleted after the transcripts are made.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions. If any questions during the interview might be unclear, feel free to report them. The question will be repeated, rephrased, or explained.

Thank you for your participation!

Olga Surogina
MSc student Management in Built Environment - TU Delft
Graduation researcher - KAAN Architecten

Explicit Consent points

PLEASE TICK THE APPROPRIATE BOXES   **yes**   **no**

A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION

1. I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.   ☐   ☐

2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.   ☐   ☐

3. I understand that taking part in the study involves: ☐   ☐
- An audio, video recording, and written notes in case the interview is held online
- Audio recording and written notes in case the interview is held in person
- All recordings will be destroyed after the interview has been transcribed
4. I understand that the study will be finalized in the summer of 2024

B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)
5. I understand that my participation is voluntary, and I may always choose to not answer certain questions or stop the interview at any time   ☐   ☐

6. I understand that taking part in the study also involves collecting specific personally iden-   ☐   ☐

tifiable information (PII) and associated personally identifiable research data (PIRD) with the potential risk of my identity being revealed. PII and PIRD data involves:
- PII: name, phone number, business email address, and employer
- PIRD: audio recordings

7. I understand that the following steps will be taken to minimize the threat of a data breach, and protect my identity in the event of such a breach:
- The collected data will be securely data stored in a designated drive
- Audio and video recordings will be deleted once they have been transcribed into text

8. I understand that personal information collected about me that can identify me, such as my name, phone number, business email address, and employer, will not be shared beyond the study team.

9. I understand that the (identifiable) personal data I provide will be destroyed by deleting it permanently from the drive upon completion of this research (summer 2024)

C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION
10. I understand that after the research study the de-identified information I provide will be used for:
- Master Thesis Report published in the open-access TU Delft student repository
- Research publication by KAAN ARchitecten and other possible applications of knowledge-sharing tactics

11. I agree that my responses, views or other input can be quoted anonymously in research outputs

Signatures

_____   _____ _____

Name of participant [printed]   Signature   Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

 Olga Surogina

_____   _____ _____

Researcher name [printed]   Signature   Date

If you have any questions about this research, please contact:
Olga Surogina, o.surogina@student.tudelft.nl
TU Delft first mentor: Paul Chan, p.w.c.chan@tudelft.nl
TU Delft second mentor and KAAN Architecten supervisor: Kees Kaan, kk@kaanarchitecten.com

INFORMED CONSENT LETTER. OBSERVATIONS

Informed Consent Letter
Rotterdam, __/__/____
Reference: Inform consent to participate in research "Knowledge about transitions".

Dear Sir or Madame,
You are invited to participate in a master's thesis research study titled "Knowledge about transitions". This study is conducted by Olga Surogina, a student from TU Delft, who is doing graduation research at KAAN Architecten.
The purpose of this research is to understand the current ongoing transitions, which affect architectural offices and to propose knowledge-sharing tactics, that architects can use at the organizational, project team, and community levels to cope with those transitions.
The observations will take 3 working weeks, where the researcher will follow the internal meetings of your project team at KAAN Architecten. The researcher will be present during the whole meeting and will be focused on collecting the following data:
- ongoing changes in the project and their triggers, which the team is currently facing,
- the behavioral patterns as a response to the changes, information flow between the participants
- agreements further actions and tasks distributions.
These observations will conducted during on-site visits to KAAN Architecten. Audio recordings will made on an external device. To the best of my ability, your answers in this study will remain confidential. I will minimize any risks by:
- Safely storing your personal data in a designated project drive. Upon completion of this research, your name and contact names will be deleted.
- All processed data will be anonymized by removing direct identifiers linked to your name.
- Observations audio recordings will be deleted after the transcripts are made.
Your participation in this study is entirely voluntary and you can withdraw at any time. In case you have any additional questions regarding the research of the purpose of the observations, please don't hesitate to ask the researcher.
Thank you for your participation!

Olga Surogina
MSc student Management in Built Environment - TU Delft
Graduation researcher - KAAN Architecten

Explicit Consent points

PLEASE TICK THE APPROPRIATE BOXES	yes	no
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated [DD/MM/YYYY], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
2. I consent voluntarily to be a participant in this study and understand that I can withdraw from the study at any time, without having to give a reason.	☐	☐
3. I understand that taking part in the study involves: • An audio, video recording, and written notes in case the observations are held online • Audio recording and written notes in case the observations are in person • All recordings will be destroyed after the interview has been transcribed	☐	☐
4. I understand that the study will be finalized in the summer of 2024		
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
5. I understand that my participation is voluntary, and I may always choose to not participate the observations meetings	☐	☐
6. I understand that taking part in the study also involves collecting specific personally iden	☐	☐

tifiable information (PII) and associated personally identifiable research data (PIRD) with the potential risk of my identity being revealed. PII and PIRD data involves:
- PII: name, business email address, and employer
- PIRD: audio recordings

7. I understand that the following steps will be taken to minimize the threat of a data breach, and protect my identity in the event of such a breach:
- The collected data will be securely data stored in a designated drive
- Audio and video recordings will be deleted once they have been transcribed into text

8. I understand that personal information collected about me that can identify me, such as my name, business email address, and employer, will not be shared beyond the study team.

9. I understand that the (identifiable) personal data I provide will be destroyed by deleting it permanently from the drive upon completion of this research (summer 2024)

C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION
10. I understand that after the research study the de-identified information I provide will be used for:
- Master Thesis Report published in the open-access TU Delft student repository
- Research publication by KAAN ARchitecten and other possible applications of knowl-edge-sharing tactics

11. I agree that my responses, views or other input can be quoted anonymously in research outputs

Signatures

_____   _____ _____

Name of participant [printed]   Signature   Date

I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

 Olga Surogina

_____   _____ _____

Researcher name [printed]   Signature   Date

If you have any questions about this research, please contact:
Olga Surogina, o.surogina@student.tudelft.nl
TU Delft first mentor: Paul Chan, p.w.c.chan@tudelft.nl
TU Delft second mentor and KAAN Architecten supervisor: Kees Kaan, kk@kaanarchitecten.com

INFORMED CONSENT LETTER. DISCUSSION

Informed Consent Letter
Rotterdam, 30/04/2024
Reference: Inform consent to participate in research "Knowledge about transitions".

Purpose of the Study: The purpose of this research is to understand the ongoing transitions affecting architectural offices and propose knowledge-sharing strategies to cope with these transitions at organizational, project team, and community levels.

Description of Procedures: Participants will be invited to participate in a workshop discussion regarding the ongoing transitions in architectural practices. The session may involve video recording and photography for documentation purposes. Any images taken will be anonymized if used in the research report.

Risks and Benefits: Participation in this study involves minimal risk. The benefits include contributing to academic research and gaining insights into current trends in architectural practices.

Confidentiality: All information provided during the workshop discussion will be kept confidential to the extent permitted by law. Personal data will be securely stored and any identifying information will be anonymized in the research report.

Voluntary Participation: Participation in this study is voluntary, and participants have the right to withdraw at any time without penalty. Participants are free to refuse to answer any questions or decline to participate in video recording or photography.

Consent: By signing below, you acknowledge that you have read and understood the information provided in this form. You voluntarily agree to participate in the workshop discussion and consent to the use of video recording and photography for research purposes.

name	email	signature

If you have any questions about this research, please contact:
Olga Surogina, o.surogina@student.tudelft.nl

ATLAS TI CODING

Code	Code	Code
● TRANSITIONS EXTERNAL	● OBSTACLES	● KST_KNOWLEDGE SHARING COPING TACTICS
● T_E_economical	● O_appearence oriented	● KST_adaptation
● T_E_procedural	● O_bias	● KST_doing new
● T_E_societal	● O_Bureaucracy	● KST_informal communication
● T_E_sustainable	● O_communication isuues	● KST_intuition
● T_E_technological	● O_control	● KST_learning by doing
● TRANSITIONS INTERNAL	● O_culture	● KST_learning from artefacts
● T_I_behavioral	○ O_detail oriented	● KST_learning from others
● T_I_design approach	● O_generation	● KST_observing
● T_I_organizational	● O_habits	● KST_reflection
● T_I_sustainable	● O_HRM	● KST_take an opportunity
● T_I_technological	● O_ignorance	● KST_vocabulary
● INTERACTION	● O_information sharing	● KST_willingness to grow
● INT_actor/actor	● O_isolation	● PARADOX
● INT_actor/AI	● O_limited experience	● ENHANCEMENT TACTICS
● INT_actor/artefact	● O_limited responsibility	● ET_C_Coaching and Mentoring
● INT_actor/group	● O_monotonous work	● ET_C_Culture of caring (trust and cooperation)
● INT_actor/tool	● O_pressure	● ET_C_High band-width communication
● INT_group/context	● O_talent migration	● ET_C_Knowledge-sharing norms
● LEVEL	● O_technology adaptation	● ET_C_Perceived support
● L_XL_interorganizational	● O_time management	● ET_PA_Developmental evaluations
● L_L_organizational	● TRIGGERS	● ET_PA_Reward knowledge-sharing behaviours
● L_M_project-bubble	● TR_collaboration	● ET_PA_Summary Reports
● L_S_project	● TR_contract	● ET_PS Space for face-to-face communication
● L_XS_personal	● TR_delegation	● ET_PS_online communication
● PARTICIPANTS OUTCOMES	● TR_education	● ET_PS_Talk Space
● PO_Architects	● TR_flat hierarchy	● ET_S_Communication skills
● PO_BIM Managers	● TR_giving freedom	● ET_S_Employee referrals
● PO_business development	● TR_identity	● ET_S_Person – organization fit
● PO_client	● TR_long term vision	● ET_T_Intranet and E-Library
● PO_external stakeholders	● TR_micromanage	● ET_T_Technology chosen to fit culture
● PO_Management team	● TR_prioritizing	● ET_T_Technology to enhance existing social networks
● PO_Project Designers	● TR_project	● ET_T_Training to use technology
● KT_KNOWLEDGE TYPE	● TR_project complexity	● ET_T_User-friendly information technology
● KT_conscious tacit	● TR_risk management	● ET_TD_Departmental Meetings
● KT_explicit	● TR_sharing work	● ET_TD_Extensive training
● KT_unconscious tacit	● TR_side activity	● ET_TD_Formalized orientation and socialization programm
● METHODS	● TR_specialization	● ET_TD_Informal Knowledge Workshops
● M_building narrative	● TR_studio_complex projects	● ET_TD_Knowledge Exchange Seminars
● M_diagramming	● TR_team spirit	● ET_TD_Team-based/cross-training
● M_Impact	● TR_time management	● ET_WD_Co-location
● M_optioneering	● TR_transparency	● ET_WD_Communities of practice
● M_Structured thinking	● TR_values	● ET_WD_Interdependency
● M_value-based design		● ET_WD_knowledge teams
		● ET_WD_Teams/cross-functional teams

Table 35. ATLAS.ti codes
(Source: by author)

TRIGGERS, OBSTACLES & OPPORTUNITIES

During the empirical research and efforts to identify potential coping strategies, the researcher encountered the challenge of structuring data that were not suitable for categorizing knowledge-sharing coping tactics. To distill the actual tactics, a system of triggers, obstacles, and opportunities was introduced, positioning features of company artifacts such as Optioneering, strategies like diversification, and people management practices such as coaching and mentoring. This additional analysis significantly contributed to understanding which features, unsuitable for this categorization, are the true knowledge-sharing coping tactics. These features address a subquestion that emerged in this research: What are the triggers, obstacles, and opportunities of the transitional and interactional processes in architectural practices?

The sequence of graphs below indicates the frequencies of codes in Atlas.TI, showing how often these triggers, obstacles, and opportunities were mentioned by research participants during the interviews. The order of the graphs follows the logic of the research questions, representing the domains of 'transition', 'knowledge-sharing' and 'knowledge-sharing coping strategies'. The final section outlines the results from an internal discussion organized for preliminary results validation, where research participants rated the featured items using Mentimeter and discussed them further. The outcomes of these identified opportunities formed the basis for the recommendations presented in the conclusion section.

F.1 Cross-Transitional features:

After the cross-transitional analysis, certain patterns have been derived. First, some elements can appear as a trigger of one transition and as opportunities or examples of others. For example, BIM implementation is a trigger of technological transition, but an example of procedural and a opportunity for project approach transitions.

It has also been noted that the most prominent cross-transitional features include:

Internal Triggers: Office and personal **ambitions** are the most prominent factor, followed by **technological advancements** and **shared values** (Figure 41).

External Triggers: also highly depend on the way the office perceive the external changes and form the **ambitions** as a respond to those, led by changes in the **contractual model** (Integrated Contract), followed by external **technological requirements**, changing **societal values**, and **market demands** (Figure 41).

Internal Obstacles: Communication issues, followed by resistance to change, particularly to **technology** and lack of **managerial support**, especially for colleagues with **limited experience** (Figure 42).

External Obstacles: Shift of the professional **responsibilities of the architect**, communication issues (Figure 42).

Internal Opportunities: Perceived support from the office, **communities of practice** and **suitable personality** for the office environment (Figure 43).

External Opportunities: Collaboration though **communities of practice** and ability for **high band-width communication** (Figure 43).
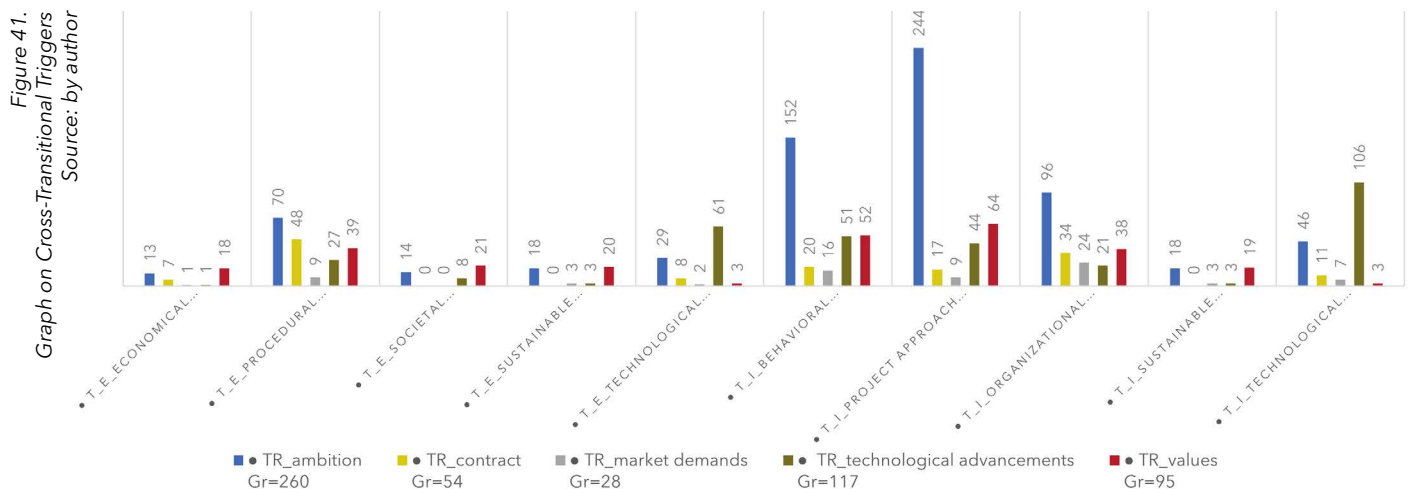

Figure 41.
Graph on Cross-Transitional Triggers
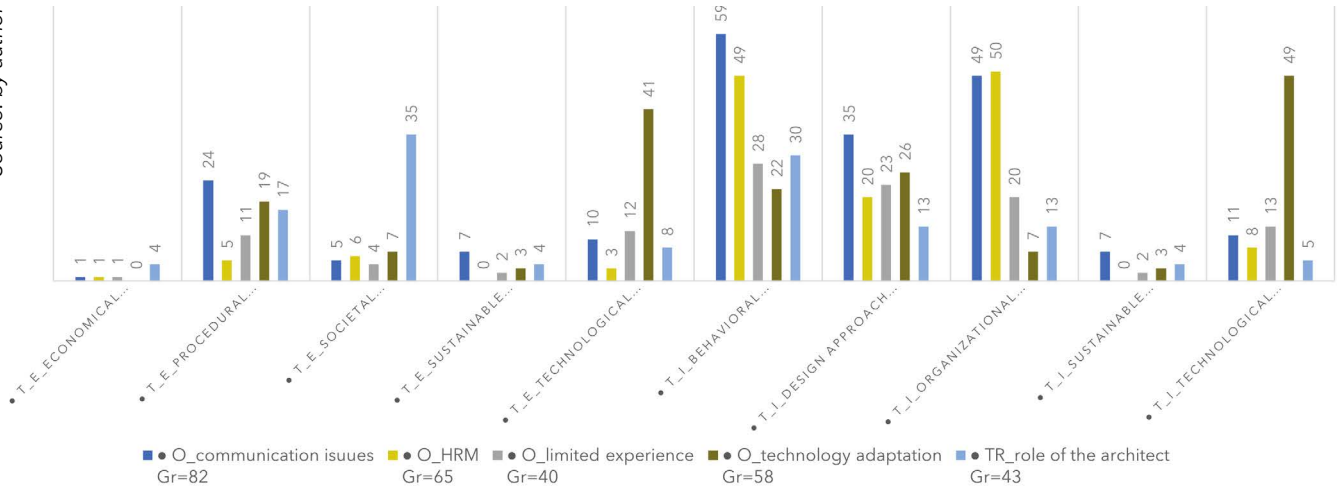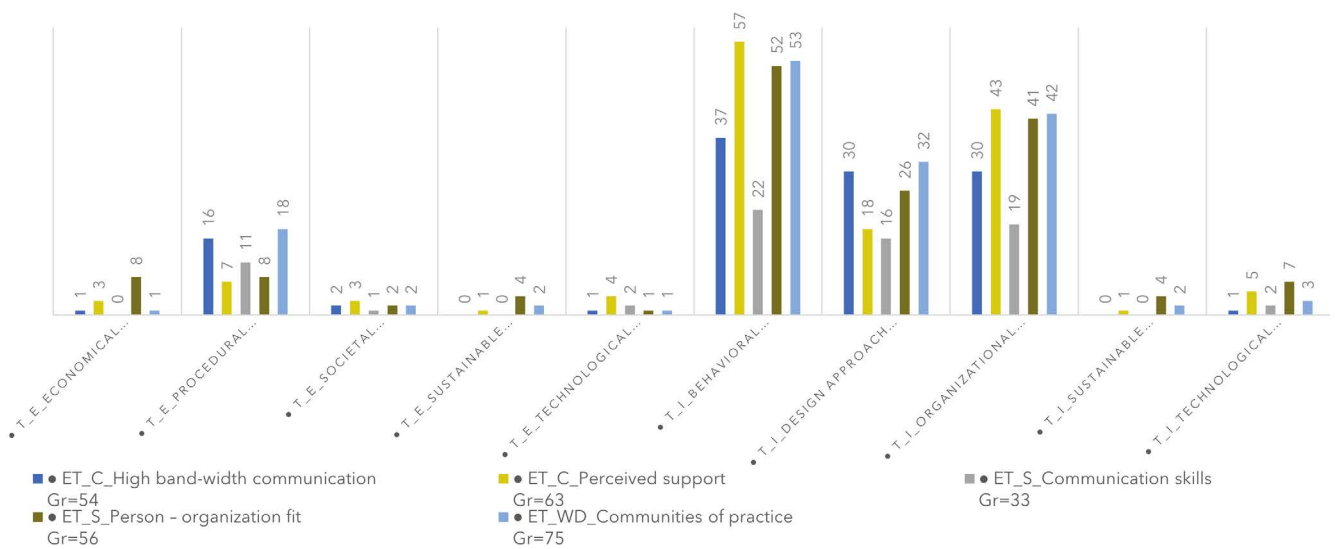*Source: by author*

Figure 42.
Graph on Cross-Transitional obstacles
Source: by author

Categories: T_E_ECONOMICAL..., T_E_PROCEDURAL..., T_E_SOCIETAL..., T_E_SUSTAINABLE..., T_E_TECHNOLOGICAL..., T_I_BEHAVIORAL..., T_I_DESIGN APPROACH..., T_I_ORGANIZATIONAL..., T_I_SUSTAINABLE..., T_I_TECHNOLOGICAL...

Legend:
- O_communication isuues — Gr=82
- O_HRM — Gr=65
- O_limited experience — Gr=40
- O_technology adaptation — Gr=58
- TR_role of the architect — Gr=43

Figure 43.
Graph on Cross-Transitional opportunities
Source: by author

Categories: T_E_ECONOMICAL..., T_E_PROCEDURAL..., T_E_SOCIETAL..., T_E_SUSTAINABLE..., T_E_TECHNOLOGICAL..., T_I_BEHAVIORAL..., T_I_DESIGN APPROACH..., T_I_ORGANIZATIONAL..., T_I_SUSTAINABLE..., T_I_TECHNOLOGICAL...

Legend:
- ET_C_High band-width communication — Gr=54
- ET_C_Perceived support — Gr=63
- ET_S_Communication skills — Gr=33
- ET_S_Person – organization fit — Gr=56
- ET_WD_Communities of practice — Gr=75

F.2 Cross-interactional features

The following chapter outlines the cross-interactional features, summarized in triggers, obstacles and opportunities for knowledge sharing in KAAN Architecten

Main Triggers: organizational ambition, **integration with academia** and industry, **technological integration**, growing **project complexity**, **shared values** and diverse **specialization** of the team members (Figure 44).

Main Opportunities: forming **communities of practice**, followed by **perceived support** from office, **high band-width communication**, **personal characteristics** to fit the office environment and the **choice of the technology**, which will fit office culture (Figure 45).

Main Obstacles: Communication issues, followed by struggles with **technology adaptation**, lack of **managerial support**, **limited experience** and mainly technologically driven **biases** (Figure 46).

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Figure 44.
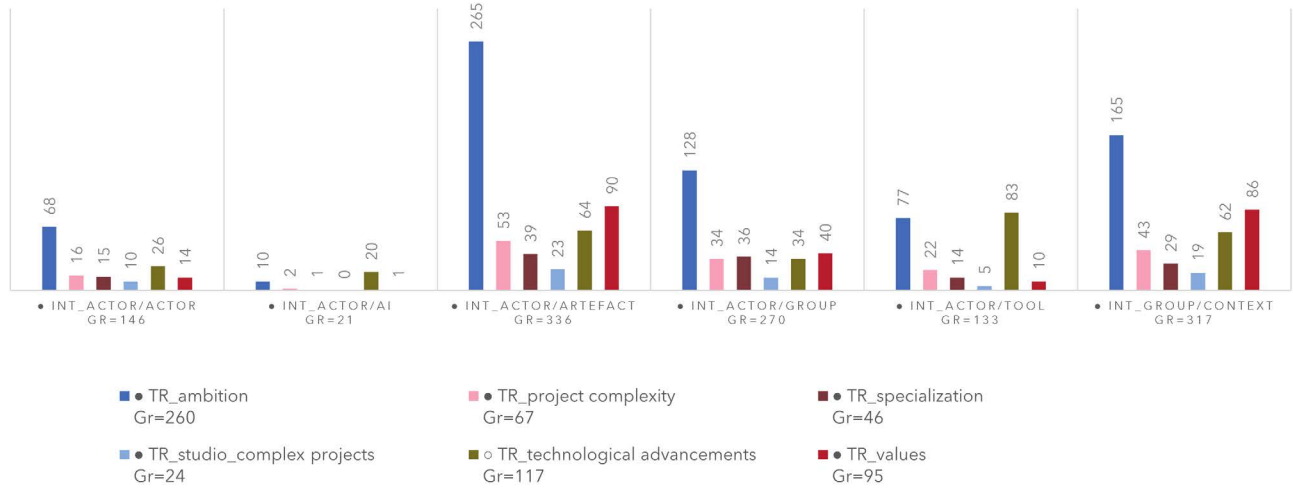*Graph on Cross-interactional Triggers*
Source: by author

TR_ambition
Gr=260

TR_project complexity
Gr=67

TR_specialization
Gr=46

TR_studio_complex projects
Gr=24

TR_technological advancements
Gr=117

TR_values
Gr=95

Figure 45.
Graphs on Cross-interactional obstacles
Source: by author

O_bias
Gr=27

O_communication isuues
Gr=82

O_HRM
Gr=65

O_limited experience
Gr=40

O_technology adaptation
Gr=58
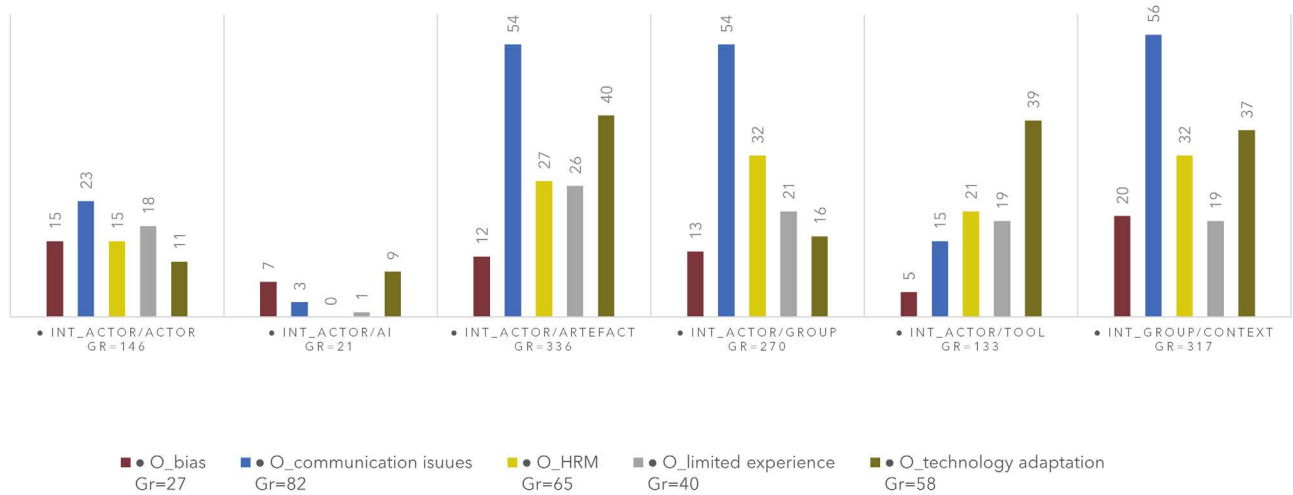
Figure 46.
Graphs on Cross-interactional opportunities
Source: by author

ET_C_Coaching and Mentoring
Gr=35

ET_C_High band-width communication
Gr=54

ET_C_Perceived support
Gr=63

ET_S_Person – organization fit
Gr=56

ET_T_Technology chosen to fit culture
Gr=36

ET_WD_Communities of practice
Gr=75
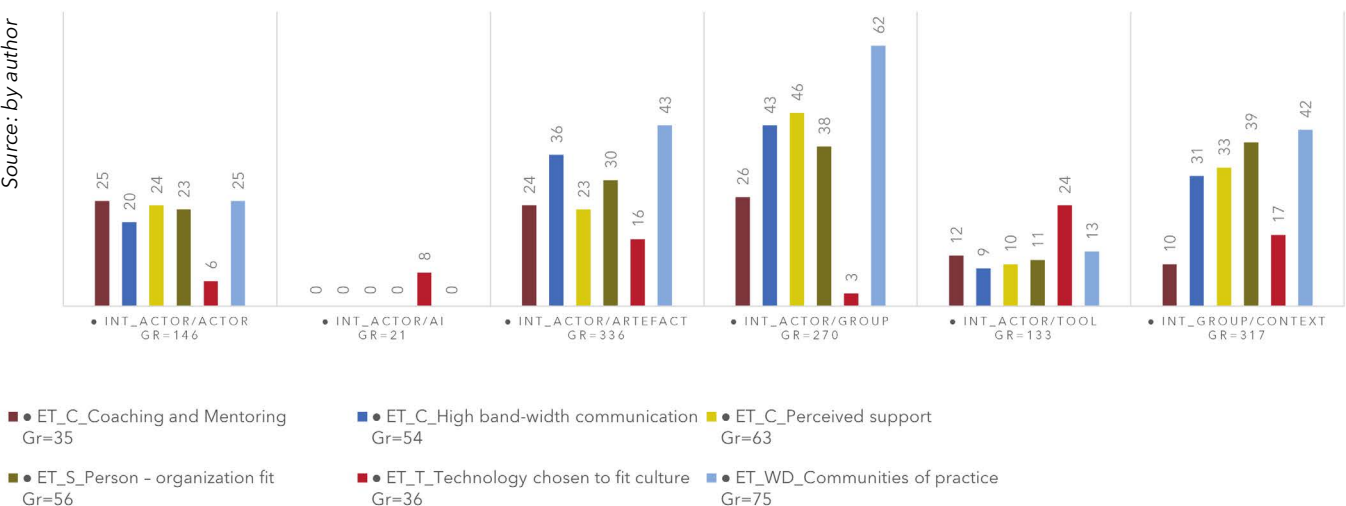
F.3 Benefits of 6IN model

Figure 47 outlines the key cross-transitional and interactional obstacles, which 6IN model is aiming to resolve by the opportunities outlined in Figure 48.

Solving the Obstacles:

Complexity in Role Responsibilities: As projects complexity grows, role responsibilities become more com-

plex, requiring clear communication and understanding to prevent inefficiencies and bottlenecks.

Resistance to New Systems and Methods (bias) : There is inherent resistance among some team members towards new systems like BIM and structured approaches, which can impede learning and adaptation.

Lack of managerial support: Intuitive decision-making can sometimes conflict with structured project management demands, causing misalignments in team objectives and strategies.

Communication Issues: Office communication challenges can hinder the effective flow of information, impacting project efficiency and team morale.

Challenges with New Technologies: Difficulties in integrating technologies like AI and parametric design, especially in transitioning to sustainable practices, can disrupt established workflows.

Limited Experience: The intricate nature of architectural projects requires patience and thorough problem-solving, which can be a significant challenge for junior employees.

Though following Opportunities:

Sharing with Empathy and Openness: Encouraging a culture of empathy and openness in sharing knowledge can help engage less ambitious employees and foster a collaborative atmosphere.

Focus on Continuous Learning and Development: Emphasizing the need for ongoing personal and professional development helps individuals adapt to changes and enhances their competencies.

Collaborative Engagement though communities of practice: Promoting robust collaboration within project teams is vital for refining design processes and achieving comprehensive project goals.

Embracing New Opportunities: A willingness to embrace new technological and methodological opportunities keeps the firm competitive and forward-thinking.

Management Support: Highlighting the critical role of management in facilitating the adoption of new technologies ensures smoother transitions and enhances team capabilities.

Mentorship and Collaboration: Enhancing mentorship and collaborative efforts within teams fosters knowledge exchange and supports professional growth.

Figure 47.
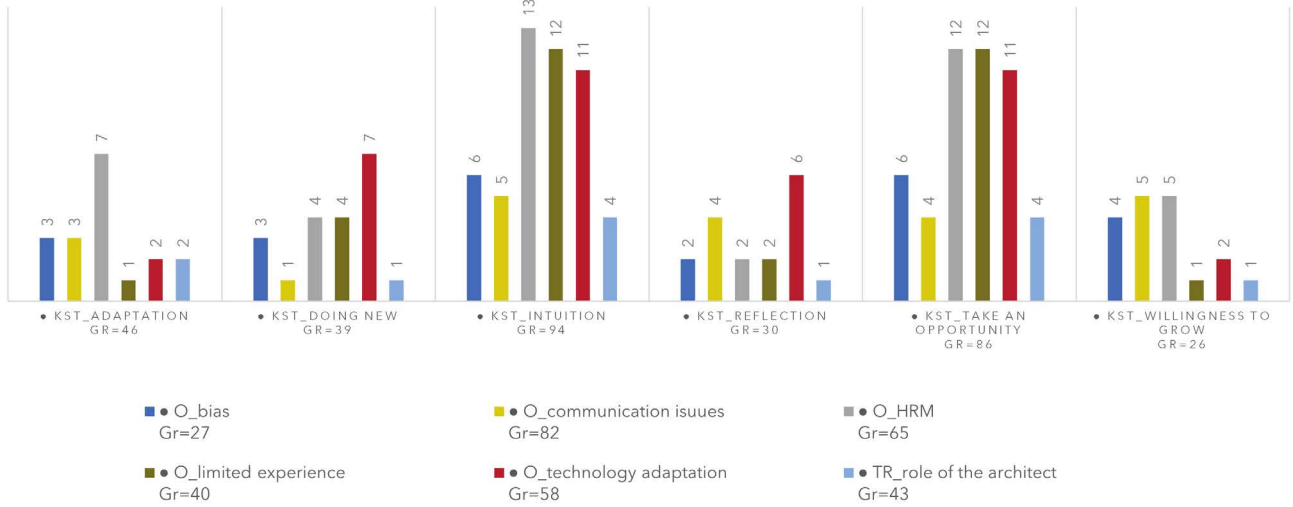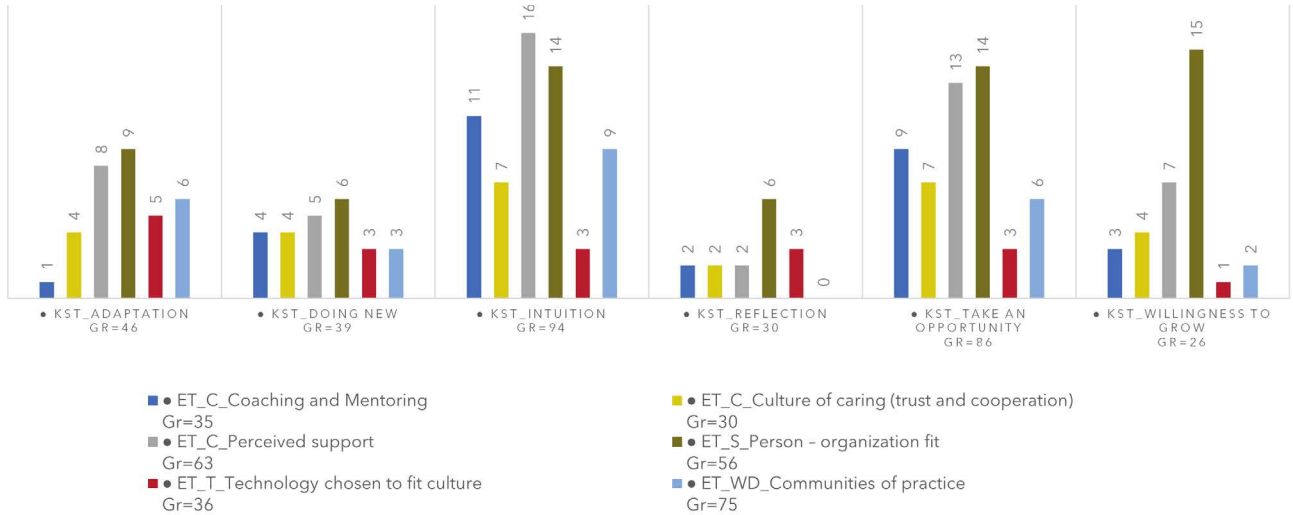*6IN resolved obstacles*
Source: by author

Figure 47. 6IN resolved obstacles

- ● O_bias
  Gr=27
- ● O_communication isuues
  Gr=82
- ● O_HRM
  Gr=65
- ● O_limited experience
  Gr=40
- ● O_technology adaptation
  Gr=58
- ● TR_role of the architect
  Gr=43

Figure 48.
6IN opportunities
Source: by author

Figure 48. 6IN opportunities

- ● ET_C_Coaching and Mentoring
  Gr=35
- ● ET_C_Culture of caring (trust and cooperation)
  Gr=30
- ● ET_C_Perceived support
  Gr=63
- ● ET_S_Person – organization fit
  Gr=56
- ● ET_T_Technology chosen to fit culture
  Gr=36
- ● ET_WD_Communities of practice
  Gr=75

F.4 Discussion on Triggers, Obstacles and Opportunities during transitions and KS

Triggers:

In the realm of cross-transitional and cross-interactional processes, both categories draw significantly from organizational ambitions and technological advancements. Cross-transitional triggers are notably influenced by internal ambitions and the external environmental pressures such as market demands and societal expectations, as reflected in the firm's strategic responses to contractual changes and external technological requirements. Conversely, cross-interactional triggers are deeply rooted in the firm's ambition to integrate with academia and the broader industry, aiming to enhance internal operations and project complexities. The internal workshop added to this by highlighting personal ambitions and team dynamics as critical internal drivers, suggesting that individual and group aspirations significantly influence both transitional and interactional dynamics, which were not as explicitly linked in the empirical data (Figure 49).

Figure 49.
Mentimeter Triggers
Source: by author

Figure 49. Mentimeter Triggers
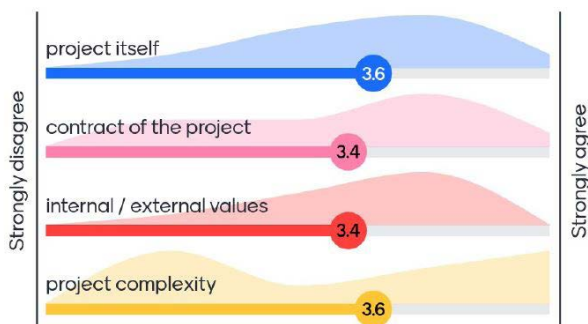
Obstacles:

Communication issues are a common obstacle across both cross-transitional and cross-interactional features, stressing the pervasive challenge of effective communication within the firm. In cross-transitional contexts, additional internal obstacles such as resistance to technological changes and a lack of managerial support particularly affect less experienced colleagues. Externally, shifts in the architectural profession's responsibilities pose significant challenges. For cross-interactional obstacles, struggles with technology adaptation and the need for better managerial support echo similar themes. Insights from the workshop emphasize ignorance and different mindsets as substantial barriers, pointing to deeper cultural and psychological issues that affect both cross-transitional and cross-interactional processes. These insights suggest that addressing these more profound cultural issues could alleviate many of the communication and adaptation challenges currently faced (Figure 50).
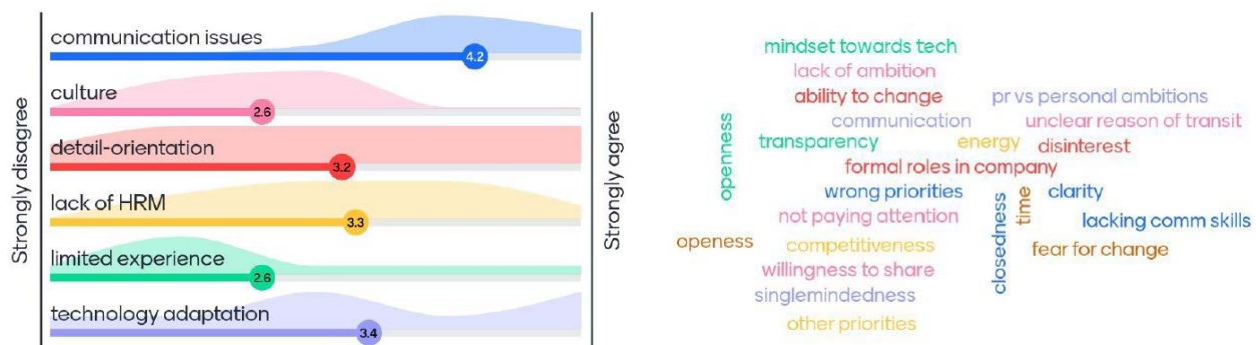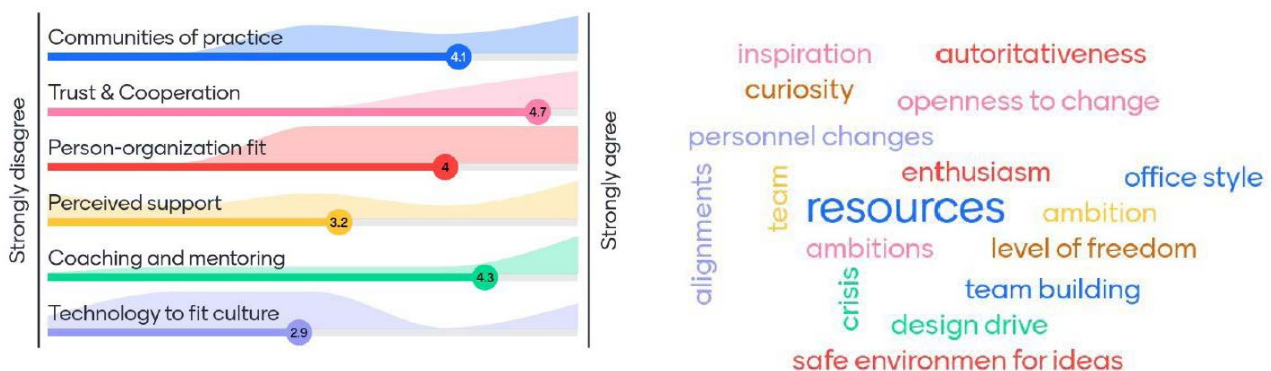
Opportunities:

Opportunities within both cross-transitional and cross-interactional features focus on leveraging internal and external collaborations to improve adaptability and responsiveness. Internally, both emphasize the development of communities of practice and creating supportive environments that align with personal and organizational goals. Externally, opportunities arise from engaging in high-bandwidth communications and collaborations that extend beyond the firm's boundaries. The workshop contributions enrich these observations by highlighting the role of available resources, given freedom, and an open mindset in exploiting these opportunities. Particularly, the enthusiasm and inspiration shared during the workshop demonstrate how a positive organizational culture can enhance both transitional and interactional processes, providing a more nuanced understanding of how these opportunities can be realized (Figure 51).

This discussion integrates data from empirical research, theoretical insights, and additional perspectives from an internal workshop, offering a comprehensive view of the triggers, obstacles, and opportunities associated with cross-transitional and cross-interactional processes. The workshop insights particularly add value by identifying deeper psychological and cultural dimensions that influence these processes, suggesting that enhancing individual and team dynamics, as well as fostering an open and supportive organizational culture, are crucial for navigating the complexities of both transitional and interactional changes within the firm.

DATA MANAGEMENT PLAN

Plan Overview

A Data Management Plan created using DMPonline

Title: BK MSc project - Graduation Project- Knowledge about transitions in architectural practices

Creator: Olga Surogina

Affiliation: Delft University of Technology

Template: TU Delft Data Management Plan template (2021)

Project abstract:
The role of an architect is changing due to ongoing sustainability, technology, and communication transitions in the built environment sector. In order to stay competitive in the market, architects have to transfer their knowledge effectively within a single project, between projects, and within an entire organization. Although a vast exploration of knowledge transfer has been done by researchers and practitioners in general management theory and in the built environment, the role which is played by social factors play in the process still remains under research. Recent studies focus on a broader scope, where socialization is a part of the approach, but there is no coping strategy for how it can be used. Alternatively, the focus is too narrow, and it analyses a particular method without positioning it to the company knowledge management strategy. Moreover, those findings are geographically and methodologically disconnected. Therefore, this research aims to investigate how knowledge-sharing can assist architects in managing ongoing and future transitions. That's why the main research question of this research is as follows:
How does knowledge-sharing help architects cope with ongoing and future transitions?
To answer this question, a series of overarching sub-questions (SQ) have to be answered:
RQ 1: What are the ongoing transitions experienced by architectural practices?
RQ 2: How does knowledge sharing influence ongoing transitional processes in architectural practices?
RQ 3: What knowledge-sharing tactics can be drawn to cope with ongoing and future transitions in architectural offices?
In order to answer the main research question, all 3 research subquestions will be first answered by theoretical studies of secondary data and then will be examined by empirical research through interviews and observations.

The outcome of this research aims to form a sequence of coping tactics for accessing knowledge about transition at inter-, intra-project, and organizational levels and the recommended set of people management practices on how to enhance knowledge-sharing coping tactics. At the same time the research aims to bridge recent studies and help architectural practices become more robust and adaptive to changes as on organizational and individual levels.

ID: 140905

Start date: 01-09-2023

End date: 10-07-2024

Last modified: 19-06-2024

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BK MSc project - Graduation Project- Knowledge about transitions in architectural practices

0. Administrative questions

1. Name of data management support staff consulted during the preparation of this plan.

My faculty Data Steward, Janine Strandberg, has reviewed the first draft of this DMP on 06.02.2024, and the second draft on 23.02.2024.

2. Date of consultation with support staff.

2024-02-23

I. Data description and collection or re-use of existing data

3. Provide a general description of the type of data you will be working with, including any re-used data:

Type of data	File format(s)	How will data be collected (for re-used data: source and terms of use)?	Purpose of processing	Storage location	Who will have access to the data
Audio-recordings of interviews with architects and audio recordings from observations from the meetings with KAAN Architecten (management and design teams)	.mp3	Interviews and observations are conducted during on-site visits to KAAN Architecten. Audio recordings are made on an external device, before being moved to Project Storage. Recordings are deleted after transcription.	Capturing the opinions on ongoing transitions in architectural offices and how knowledge-sharing helps to cope with those transitions from participants	External recording device (temporary storage) + Project Storage (primary storage) + OneDrive	Master student: Olga Surogina + supervisors: Paul Chan, Kees Kaan
Personally Identifiable Information (PII): participants' name, email, work address, company name	.pdf, .xlsx	Informed consent forms are signed digitally and contain participants' name + email	For administrative purposes: obtaining informed consent and communicating with participants	Project Storage signed informed consent forms as well as other contact information (PII) is stored separately from research data, to minimize the risk of re-identification.	same as above
Pseudonymized transcriptions of interviews	.txt	Pseudonymized transcriptions created manually based on audio-recordings. Participants are asked to review the transcriptions of their interview before the transcript is finalized.	Privacy-preserving data on the topic of 'knowledge about transitions' from participants	Project Storage +OneDrive the key to pseudonymized data is on the RU file folders, without access from outside. A password manager ([Keepass](#)) is used for the keys. The key is available to the researcher only	same as above
Pseudonymized data on opinion on 'knowledge about transitions' from interviews and observations diary	.csv	Data obtained from coding pseudonymized transcriptions using Atlas software. TU Delft has a campus license.	Privacy-preserving data on opinions on 'knowledge about transitions' from participants	Project Storage + OneDrive the key to pseudonymized data is on the RU file folders, without access from outside. A password manager ([Keepass](#)) is used for the keys. The key is available to the researcher only	Same as above
Report/thesis	.pdf	Serves as the record of the process as well as documentation	Long-term documentation	Project Storage + OneDrive	Same as above
observations diary	hand notes, .docx	from observations of research participants. participants' identity is pseudonymized.	Capturing on ongoing transitions in architectural offices and how knowledge-sharing helps to cope with those transitions from participants	Project Storage + OneDrive the key to pseudonymized data is on the RU file folders, without access from outside. A password manager ([Keepass](#)) is used for the keys. The key is available to the researcher only	Same as above

4. How much data storage will you require during the project lifetime?

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- < 250 GB

II. Documentation and data quality

5. What documentation will accompany data?

- Data dictionary explaining the variables used
- README file or other documentation explaining how data is organised
- Data will be deposited in a data repository at the end of the project (see section V) and data discoverability and re-usability will be ensured by adhering to the repository's metadata standards
- Methodology of data collection

As data produced by MSc students (mostly) belongs to the student (in contrast to research data of TU Delft employees, which (mostly) belongs to the university). As such, while students can are not obliged to do so according to the TU Delft Research Data Framework Policy . In order to protect the research participants, the supporting material (pseudonymized transcripts and datasets with coded responses) will NOT be deposited in the TU Delft Education repository.

III. Storage and backup during research process

6. Where will the data (and code, if applicable) be stored and backed-up during the project lifetime?

- Another storage system - please explain below, including provided security measures
- Project Storage at TU Delft
- OneDrive

Project Storage: Primary research data storage. Only TU Delft team members (Master student and supervisors) have access. Survey and interview data will be stored in separate folders, and within the interview folder, there are separate folders for audiorecordings
and anonymous transcriptions. Informed consent forms and contact information are encrypted separately from research data to minimise risk of re-identification.
OneDrive: Used as secondary storage in addition to Project Storage, mainly for convenience when working with data analysis or report writing. Master student and supervisors have access.
External recording device: Used as a temporary storage location for recorded on-site interviews. Interviews will be deleted from device as soon as they are moved to Project Storage.

IV. Legal and ethical requirements, codes of conduct

7. Does your research involve human subjects or 3rd party datasets collected from human participants?

- Yes

8A. Will you work with personal data? (information about an identified or identifiable natural person)

If you are not sure which option to select, first ask your Faculty Data Steward for advice. You can also check with the privacy website . If you would like to contact the privacy team: privacy-tud@tudelft.nl, please bring your DMP.

- Yes

The research data collected in the project will be pseudonymized

8B. Will you work with any other types of confidential or classified data or code as listed below? (tick all that apply)

If you are not sure which option to select, ask your Faculty Data Steward for advice.

- Yes, data which could lead to reputation/brand damage (e.g. animal research, climate change, personal data)

"data that could lead to brand/reputation damage" is referred to the interview data, which is avoided by allowing participants to review their own transcripts.

9. How will ownership of the data and intellectual property rights to the data be managed?

For projects involving commercially-sensitive research or research involving third parties, seek advice of your *Faculty Contract Manager* *when answering this question. If this is not the case, you can use the example below.*

As data produced by MSc students (mostly) belongs to the student (in contrast to research data of TU Delft employees, which (mostly) belongs to the university). As such, while students can are not obliged to do so according to the TU Delft Research Data Framework Policy . In order to protect the research participants, the supporting material (pseudonymized transcripts and datasets with coded responses) will NOT be deposited in the TU Delft Education repository. The supporting data can ONLY be shared at the request to the student and permission of the supervisors.

10. Which personal data will you process? Tick all that apply

- Data collected in Informed Consent form (names and email addresses)
- Email addresses and/or other addresses for digital communication
- Names and addresses
- Signed consent forms
- Other types of personal data - please explain below

Personally Identifiable Information (PII): interviewee name, work address, company name, job role and description, email address are processed for administrative reasons (to obtain informed consent and communicate with participants).

11. Please list the categories of data subjects

The employees in the architectural studio: Managing Directors, Project Architects, Project Managers, BIM and Visualizations specialists, Business Development people, Architects, Interns

12. Will you be sharing personal data with individuals/organisations outside of the EEA (European Economic Area)?

- No

15. What is the legal ground for personal data processing?

- Informed consent

The HREC informed consent guide and template will be used to create the informed consent forms for the interviewees and observations

16. Please describe the informed consent procedure you will follow:

Interviews: All interview participants will be asked for their written consent for taking part in the study and for data processing before the start of the interview. Interviewees will also be allowed to review the anonymous transcriptions from their interviews before they are finalised and used for analysis.
Observations: All observations' participants will be asked for their written consent for taking part in the study and for data processing before the start of the observations.

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17. Where will you store the signed consent forms?

- Same storage solutions as explained in question 6

Informed consent forms and contact information are stored in the Project Storage and encrypted separately from research data to minimise risk of re-identification.

18. Does the processing of the personal data result in a high risk to the data subjects?

If the processing of the personal data results in a high risk to the data subjects, it is required to perform a <u>Data Protection Impact Assessment (DPIA).</u> **In order to determine if there is a high risk for the data subjects, please check if any of the options below that are applicable to the processing of the personal data during your research (check all that apply).**
If two or more of the options listed below apply, you will have to <u>complete the DPIA</u>**. Please get in touch with the privacy team: privacy-tud@tudelft.nl to receive support with DPIA.**
If only one of the options listed below applies, your project might need a DPIA. Please get in touch with the privacy team: privacy-tud@tudelft.nl to get advice as to whether DPIA is necessary.
If you have any additional comments, please add them in the box below.

- None of the above applies

22. What will happen with personal research data after the end of the research project?

- Other - please explain below
- Personal research data will be destroyed after the end of the research project

As data produced by MSc students (mostly) belongs to the student (in contrast to research data of TU Delft employees, which (mostly) belongs to the university). As such, while students can are not obliged to do so according to the <u>TU Delft Research Data Framework Policy</u> . In order to protect the research participants, the supporting material (pseudonymized transcripts and datasets with coded responses) will NOT be deposited in the TU Delft Education repository. The supporting data can ONLY be shared at the request to the student and permission of the supervisors.
Audio-recordings of interviews and observation meetings are destroyed after completion of pseudonymised interview transcriptions. All other personal research data will be destroyed at the latest 1 month after the end of the project.

23. How long will (pseudonymised) personal data be stored for?

- Other - please state the duration and explain the rationale below

As data produced by MSc students (mostly) belongs to the student (in contrast to research data of TU Delft employees, which (mostly) belongs to the university). As such, while students can are not obliged to do so according to the <u>TU Delft Research Data Framework Policy</u> . In order to protect the research participants, the supporting material (pseudonymized transcripts and datasets with coded responses) will NOT be deposited in the TU Delft Education repository.

24. What is the purpose of sharing personal data?

- Other - please explain below

Personal data will not be shared and destroyed upon the research completion

25. Will your study participants be asked for their consent for data sharing?

- Yes, in consent form - please explain below what you will do with data from participants who did not consent to data sharing

As direct interview quotes of research participants with pseudonymized identification numbers will be used in the graduation report, the research participants will be asked for their consent for data to be shared. Participants who do not consent to data sharing will not be included in the research project.

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V. Data sharing and long-term preservation

27. Apart from personal data mentioned in question 22, will any other data be publicly shared?

- I do not work with any data other than personal data

29. How will you share research data (and code), including the one mentioned in question 22?

- My data can't be shared in a repository, but the metadata will be registered in 4TU.ResearchData and all research publications resulting from the project have a statement explaining what additional datasets/materials exists; why access is restricted; who can use the data and under what circumstances.

VI. Data management responsibilities and resources

33. Is TU Delft the lead institution for this project?

- Yes, leading the collaboration - please provide details of the type of collaboration and the involved parties below

While TU Delft is leading the collaboration, the internship agreement is signed with KAAN Architecten for research conduction.

34. If you leave TU Delft (or are unavailable), who is going to be responsible for the data resulting from this project?

First mentor, Paul Chan P.W.C.Chan@tudelft.nl

35. What resources (for example financial and time) will be dedicated to data management and ensuring that data will be FAIR (Findable, Accessible, Interoperable, Re-usable)?

4TU.ResearchData is able to archive 1TB of data per researcher per year free of charge for all TU Delft researchers. We do not expect to exceed this and therefore there are no additional costs of long term preservation.

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