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Introducing a Model for How Knowledge-Driven Agile Innovation Can Drive Digital Transformation in Firms

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Abstract: Digital transformation often arises from the distribution of tasks among interdisciplinary teams of experts. One important factor that determines the success of digital transformation relates to an organization's ability to innovate in an agile manner. In this article, we identify key drivers of digital transformation, which include organizational agility, knowledge management and innovation. Another crucial aspect of knowledge management relates to the coordination of knowledge. It is important for organizations to focus on knowledge coordination because the lack of coordination can dissuade them from meeting the demands for flexibility and speed during digital transformation, thereby negating the potential benefits from adopting an agile innovation methodology. To examine these issues, we introduce a model to establish how agile knowledge management practices can foster innovation in an organization's digital transformation. Our model also highlights how knowledge coordination can create an environment that fosters organizational agility. To facilitate knowledge-driven agile innovation, we further highlight several people management practices that can play a role in fostering knowledge sharing behaviors during digital transformation. In addition, our article illustrates how agile innovation can play a key role in the knowledge management aspect of an organization's digital transformation using case studies, including that of General & Marine Agents Pte Ltd, an insurance broker headquartered in Singapore.

Keywords: Knowledge Management, Organizational Agility, Knowledge Coordination, Digital Infrastructure, Digital Talent & Culture, Digital Transformation, Agile Innovation

1. Introduction

Digital transformation is often touted as an over-hyped methodology that only large organizations with huge profits can afford to delve into. In reality, digital transformation is not a solution to a problem, but an innovative way of doing things. It is a continuous journey that takes place over an extensive period of time and does not need to start organization-wide. It can start small, with trial and error runs before being adopted on a larger scale. It can be a phased approach, and does not need to have many resources assigned to it from the start. Neither does it need a large budget necessarily to start the journey. It is also not specifically about technology but rather about how using technology can enable a company's workforce to do their jobs more efficiently. It is about retraining resources, readjusting mindsets, re-planning processes, digitizing chores, expanding business, and more importantly doing things better. Technology just serves as an aid for digital transformation, but it is more about the overall human factor of an organization, and how it is approached by the business, that forms the focal point.

One key aspect that determines the success of digital transformation relates to an organization's ability to innovate in an agile manner in response to market changes and other external shocks, which can affect businesses dramatically [1]. Organizations can systematically drive innovation in their digital transformation efforts by incorporating agile knowledge management practices. Knowledge management refers to the process of continually managing knowledge of all kinds and requires a company-wide strategy comprising policy, implementation, monitoring and evaluation [2] While the agile methodology was originally developed as a more adaptive and

efficient approach to software production, it has since been adopted in settings beyond its original context as a means to help organizations build organizational flexibility amidst increasingly complex and dynamic environments, especially in the knowledge management context. In adopting the agile methodology, organizations seek to increase organizational flexibility by adopting new organizational forms, engaging in organization-wide communication, moving from traditional hierarchy towards networks, and substituting formal cooperation and coordination with more spontaneous forms of interaction. The agile methodology is widely seen as a reliable means of accelerating project development and execution, and boosting innovation within organizations [3].

Given that innovation in digital transformation often arises from the distribution of tasks among interdisciplinary teams of experts, another crucial aspect of knowledge management relates to the coordination of knowledge. It is important for organizations to focus on knowledge coordination because the lack of coordination can dissuade them from meeting the demands for flexibility and speed during digital transformation, hence negating the potential benefits expected from the adoption of an agile innovation methodology. To examine these issues, we introduce a model, which tries to establish how agile knowledge management practices can foster innovation in an organization's digital transformation. The model also highlights the enhancing role that knowledge coordination can play in creating an environment that fosters organizational agility. To facilitate knowledge-driven agile innovation, we have also proposed several people management practices that may foster knowledge sharing behaviors during digital transformation.

Specifically, this article illustrates how agile innovation can play a key role in the knowledge management aspect of an organization's digital transformation using case studies, including that of g&m Insurance, and its digital transformation journey in 2020 (refer to Appendix).

2. Key Dimensions of Digital Transformation

Recent developments in digital technologies have provided organizations with the tools to fundamentally change the ways in which they operate [4]. Organizations that can leverage on these developments to make changes to their internal structures stand to put themselves at a significant competitive advantage relative to their competitors [5]. In order to put themselves in the best possible position to reap the benefits of rapid technological developments, companies often seek to undergo a digital transformation [6]. Digital transformation refers to the integration of digital technologies and business processes in a digital economy [7]. There is evidence that organizations are increasingly concerned about how they manage digital transformation and are allocating more resources to support their digital transformation efforts. For example, a recent study highlights that 38% of organizations feel that technological changes (including digital transformation) will have the greatest effect on their business decisions over the next year [8], ranking higher than other considerations such as competition, economy, and politics. Correspondingly, organizational spending on technologies to support their digital transformation efforts have been estimated to be $1.3 trillion in 2018 and is expected to grow at an annual rate of almost 18% till 2021 [9]. After assessing such data, we propose that digital transformation should comprise of the following three critical enablers:

2.1. Business Model

Prior research suggests that there are three layers that make up an organization's business model [10]. The top layer represents an organization's value proposition, which establishes its product offering and model of revenue generation. The middle layer represents an organization's value architecture, which establishes how it senses, creates, distributes, and captures value. The base level represents an organization's functional architecture, which establishes the core activities of the firm, including product innovation and infrastructure for production and delivery.

Digital transformation provides organizations with the opportunity to not only improve upon existing business models but to also create new business models where appropriate. In particular, digital technologies have the potential to fundamentally reshape aspects of an organization's business model related to its value proposition and architecture. For example, research from IBM's Institute for Business Value [11] highlights that digital technologies can enhance or augment existing physical products or services with digital content, information, insights, and engagement. It can also extend the offerings of existing physical products or services through digital content, thus creating new revenue streams for an organization. Further, digital technologies can allow organizations to redefine the value that is delivered to customers by replacing traditional products or services with digital alternatives.

2.2. Digital Infrastructure

Digital infrastructure refers to the basic informational technologies and organizational structures, along with the related services and facilities necessary for the enterprise to function [12] As an organization embarks on digital transformation, its digital infrastructure can directly support the functional architecture layer of its business model. Research highlights four key considerations for organizations with respect to digital infrastructure in digital transformation [13]:

1) *Complexity* – This focuses on the processes by which digital technologies can be adapted to internal and external environments of an organization and used independently by different stakeholders.
2) *Network* – This focuses on how different users 'translate and inscribe' needs into digital technologies, creating a network of actors that form part of the digital infrastructure.

3) *Relational* – This focuses on how various socio-technical relations can emerge from IT-related activities within an organization.
4) *Strategic asset* – This focuses on how managers in an organization initiate and implement changes in the digital infrastructure to increase the alignment between its digital resources and its strategic objectives.

2.3. Digital Talent and Culture

The members of the digital transformation project team are a key dimension that drives digital transformation. Researchers have often referenced the concept of 'technology fallacy' [14], which revolves around the mistaken belief that business challenges are caused by digital technologies. Hence, the solution is also going to lie in digital technologies. However, in reality, people determine the success of an organization's digital transformation efforts. While it is relatively easy to implement a new technology, it can be extremely difficult to assemble people with the skills to use that technology and to change the way that an organization conducts its business activities or the way that its employees work. A recent survey highlights the problems that organizations face with respect to digital talent, with only 15% of respondents saying that they agree that that they have the personnel necessary for the digital transformation of their organizations [15].

One factor, which influences how an organization's digital talent works, is its digital culture. An organization's culture refers to the value and characteristic set of behaviors that define how it gets things done. Correspondingly, culture can provide a tacit code of conduct, which guides employees to act appropriately and make choices that advance the organization's goals and strategies. An organization's digital culture thus relates to aspects of its culture that allows it to integrate digital technologies, systems, processes, and structures [16]. Research highlights that a digital culture is important for an organization undergoing digital transformation because it can empower digital talent to develop results faster, serve as a magnet to attract talent, and generally reduce the organization's risk of transformation failure [17]. In building a strong digital culture, organizations should focus on five key elements:

1) External, rather than internal, orientation - A digital culture should encourage employees to look outward, to engage with partners and customers to create solutions.
2) Delegation over control – A digital culture encourages employees to take charge of decision-making. Employees should follow guiding principles rather than receive explicit instructions on how to perform their work.
3) Boldness over caution – Rather than preserving the status quo, employees should be encouraged to 'take risks, fail fast, and learn.'
4) More action; less planning – In the fast changing digital world, a digital culture should encourage continuous iteration rather than perfecting an idea or solution before launching it.
5) Collaboration over individual effort – Successful digital transformation efforts often result from collective work and information sharing across an organization. Accordingly, a digital culture should encourage greater levels of transparency and interaction among employees.

3. Knowledge Management for Organizational Agility in Digital Transformation

Organizational agility refers to an organization's ability to rapidly change or adapt in response to change [18]. Agile organizations are able to manage both the anticipated and unanticipated changes in their environments and are able to operate profitably in competitive and dynamic situations [19]. One particularly important aspect of an organization's agility in relation to digital transformation relates to its agility in innovation. Innovation refers to the positive change that comes from the application of new knowledge [20]. Research has highlighted an organization's innovation capability and processes as well as an innovative culture as key enablers of digital transformation [5]. Given that successful digital transformation encompasses an organization's ability to adapt, respond, and position itself for success in the face of rapid technology evolution [6], agile innovation models can play an important role in organizations looking to engage in innovative digital transformation activities. Agile innovation would be especially pertinent to an organization's digital transformation considerations to the extent that digital transformation is seen not a solution to a problem, but as an innovative way of doing things which focuses on the overall human factor of an organization, and how it is approached by the business.[1]

A key aspect of agile innovation relates to an organization's knowledge management strategies [21-23]. Specifically, agile innovation allows organizations to manage innovation activities more dynamically because it recognizes that not all knowledge needs to be accessed in situ and adopts a systematic process in defining how knowledge available in any location should be accessed. This approach gives organizations more flexibility in deploying their innovation resources [24]. Figure 1 presents our model of how knowledge management in agile innovation can drive digital transformation.

1 The following aspects of digital transformation emphasizes the focus on it being seen as an innovative way of doing things. First, digital transformation is actually a continuous journey that takes place over an extensive period of time and does not need to start organization-wide. It can start small, with trial and error runs before being adopted on a larger scale. It can be a phased approach, and does not need to have many resources assigned to it from the start. Neither does it need a large budget necessarily to start the journey. Second, it is not specifically about technology but rather about how using technology can enable a company's workforce to do their jobs more efficiently. It is about retraining resources, readjusting mindsets, re-planning processes, digitizing chores, expanding business, and more importantly doing things better. Technology just serves as an aid for digital transformation.

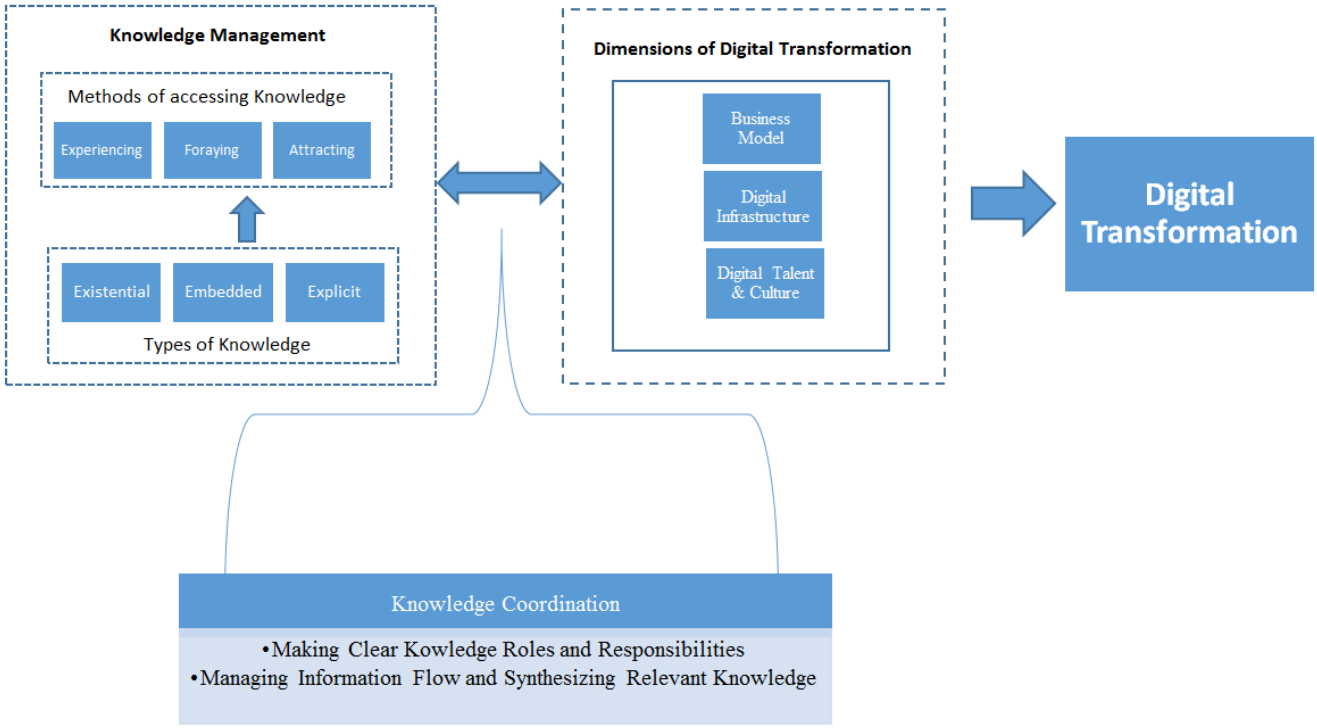

Figure 1. *Knowledge management– the missing puzzle piece in Agile Innovation as a Driver of Digital Transformation.*

In our model, we differentiate between three types of knowledge, and how they should each be accessed and coordinated.

3.1. Attracting Explicit Knowledge

An organization *attracts* knowledge by encouraging holders of that knowledge to seek out and share knowledge with the organization. Using *attracting* as a means to access knowledge can bring substantial benefits to an organization because it allows it to access relevant knowledge without having to maintain a physical presence at the source of the knowledge, thus reducing the costs incurred (relative to accessing the knowledge in situ).

Organizations can most effectively *attract* knowledge that is explicit in nature and which exhibits three key attributes. First, such knowledge is codified and can be fully communicated in blueprints, drawing, databases, programs, manuals, or prototypes. It can be understood independent of the context or environment in which it as originally created. Second, such knowledge is owned by someone or some entity. It is often associated with intellectual property rights or content. Third, such knowledge should be close or complementary to the organization's existing knowledge base because knowledge that is too distant would be extremely difficult for an organization to effectively access via *attracting*.

While the digital infrastructure that an organization requires to support its digital transformation can be complex and consist of technical components and networks [25], these requirements are often relatively well-defined. With new technologies developing rapidly around the world, *attracting* represents an appropriate mode to obtain knowledge about complementary technologies that can help an organization to develop its digital infrastructure for digital transformation. In our case study of a Singapore-based insurance broker called g&m, we have observed that when an SME tries to attract new technology, it has to first assess whether there is enough data to test the validity of the solutions. g&m engaged KPMG to implement lean methodology processes. Attracting KPMG's knowledge and expertise to create lean methodology based processes helped the company see a revenue growth of almost 1000% in four years. Once the knowledge about the processes was 'attracted', a prioritization exercise was performed to stack the value chain components and redesign existing processes across departments to reduce and eliminate duplicate and parallel functions at the enterprise, business unit and individual job levels, minimise labor-intensive tasks and processes and rationalize manual workload. It also involved the utilization of the existing infrastructure and functionalities, a detailed feasibility analysis, realistic and quantifiable measures and incentives, and a well-defined implementation plan. A few internal tools were also developed to help generate reports for insurance underwriters that included capabilities to create, view, administer reports, and analyze scorecards and dashboards. The process amendments helped foster process efficiency, generated savings, improved profit and sales and enhanced customer experiences.

On a separate note, firms have also often used 'attracting' for market development. For example, Phillips, a company well renowned for consumer electronics transformed itself to focus on its healthcare arm and grew its business in the sector

through complementary technologies. The company built a product portfolio for healthcare through a combination of its own innovations as well as acquisitions. Acquisitions such as LifeLine and Respironics helped grow the business while breakthrough new technologies such as, low dosage radiation protocol, electronic intensive care unit algorithms and development in the field of genomics furthered its reputation in the specialist medical market. Phillips worked with institutions and enterprises to design healthcare services of the future including hospitals suited to a particular demographic, diagnosis, monitoring and extended care outside the hospital, at homes. By collaborating with hospitals, the company created new business models that enabled the delivery of out of the box and specialized services [26].

3.2. Foraying for Embedded Knowledge

Foraying relies on using a relatively small team of people to act as relays between their own organizations and the new source of knowledge. It involves these small teams embarking on 'learning expeditions' to find and access information as it exists in its original context or situation. These small teams are then responsible for decontextualizing and transferring the knowledge back to their organizations. *Foraying* is an approach which allows organizations to more quickly and efficiently access embedded information than maintaining a more permanent physical presence on site. In our case study, we noted that after transferring all physical data into an electronic database, g&m tried to restructure its organization to prepare it for digital transformation. One of the first things the company did towards this end was to establish a new team of marketing experts who could assess the existing data and analyze content from it to determine the products the company could focus on for future growth. Such a strategic method of foraying into existing knowledge through a small team, rather than the involvement of the entire organization, allowed g&m to start small but in a more focused way to achieve digital transformation. Using existing historical data of the company allowed the firm to focus on its core knowledge base. However, at the same time, the idea was to allow new ideas to flow in, without having a preferential treatment of existing data. Moreover, the focus was clearly identified, with targeted new segments where the company was likely to have existing expertise to serve the market like focusing on small and medium enterprises, which the company was already servicing on a small scale. In other words, the company forayed into new market segments by deciding on a clear point of entry.

Embedded knowledge that can most effectively be accessed by *foraying* exhibits three key attributes. First such knowledge should exist relatively closely to the organization's core knowledge base because in order for expedition teams to be able to effectively learn and decontextualize knowledge and then put it to use in the context of the home organization's needs, they will need to have some familiarity with the embedded knowledge. Second, while the nature and type of knowledge being pursued by the expedition teams should be defined loosely enough such that it leaves sufficient room for discovery and learning, organizations should also ensure that the scope of the knowledge being sought is clearly defined. For example a scope of 'anything of interest' is likely to be too broad and will make it difficult for the expedition teams to yield anything of specific use for the organization. Third, *foraying* expeditions are likely to be more successful when teams have a clear point of entry. Accordingly, knowledge holders should be identifiable before expeditions are mounted.

Innovative business models that support digital transformation often require novel insights. Organizations need to consider approaches to designing business models that can create new perspectives by looking beyond known assumptions, barriers, and constraints [27]. *Foraying* represents an appropriate approach that allows organizations to effectively access relevant knowledge to develop new business models in digital transformation. In particular, to the extent that successful and innovative business models have been developed in other markets or industries, learning expeditions can be useful in allowing an organization to learn, decontextualize, and apply relevant aspects of these models to their own context. In our case study on g&m we observed, that during the COVID-19 pandemic, insurance brokerage business through its traditional model of using human agents to bring in business had started to fail. The firm had then started to experiment with digital aggregator business model for its existing products, which included insurance products for luxury cars and SME's. g&m introduced a 'Contact us' feature on its website, where clients could get a quote and unbiased advise after filling in an online form with some basic details. The company had started small with a small team of people brainstorming ideas on the project, and intended to implement it organization wide once the first trials were successful. Additionally, the company had just digitalized a small portion of the entire purchase and consumption process to see if the aggregator method worked for their existing clients. As some of the initial client contacts in the acquisition process started to be executed through digital marketing methods, g&m realised that there was a potentially infinite market on the internet. g&m had forayed into the online aggregator model due to changing market conditions. New government regulations had been pushing towards automation practices in the industry, and g&m started to pivot slowly from B2B towards B2C customers because of the changing business.

However, while changing industries may sometimes drive new business models, at other times it is the failure of an existing model that triggers such transformations. Digitally native ride-hailing companies for example, pivoted quickly to online delivery amid plummeting demand for their core transportation services during the pandemic. One particular example is Lyft, which made its first foray into on-demand delivery, distributing meals and essentials on behalf of governments, nonprofits, and other organizations to cope with reduced demand for its existing business [28].

3.3. Experiencing Existential Knowledge

Experiencing refers to knowledge which is accessed by "learning by doing, seeing, and being there." Such knowledge is typically complex, locally rooted, and deeply embedded. It is also neither definable nor easily observable. Often, such knowledge is not formalized but is instead held in norms, social interactions, and culture. Accordingly, the best way to access existential knowledge requires a full immersion in the local context, and involves the setting up of a physical site (such as an innovation lab) to allow the organization to "learn by doing, seeing, and being there" (i.e. *experiencing*). Also, given the complexity of existential knowledge, it is unlikely that specialists from one functional group will be successful in accessing knowledge by *experiencing*. Instead, a relatively diverse group of specialists from a variety of functional groups often need to work together to access the knowledge.

In our study of g&m we observed, that while the company had focused on expanding its marketing division to aggressively expand its market share in new segments, the company had also made it an organizational agenda to implement tools and processes to assist in its digital transformation journey. To begin with, the company had implemented KPMG processes to prioritize value chain components. Secondly, the company had tried to foray into setting up an aggregator website for insurance products, which was a completely new step for the company. However, the firm had worked in the Singapore market for many years and had collected data about customers, their choices, preferences, pain points etc. Therefore, while the company was trying to introduce a completely new product and had not ventured into online aggregation earlier, it had local knowledge that could help the organization set up a customized platform by experiencing, as explained above. In addition, we noted that there were very few organizations in Singapore providing aggregator services in Singapore, which was a new concept in the country. However, aggregator platforms had shown to be successful in other countries like U.K. and hence there was legitimate proof of its efficacy as a business. However, since parallel knowledge of such platforms for the Singapore market did not exist on a large scale, the full range of knowledge could only be achieved from several sources. Moreover, this knowledge was a complex web of information from which key knowledge pertaining to web aggregation of insurance products for certain segments (like car insurance and small organization insurance) needed to be extracted.

Given that *experiencing* represents the most expensive and long-term of the three ways of accessing knowledge which we explore, existential knowledge should only be accessed by *experiencing* when it exhibits the following three key attributes. First, the knowledge that is being sought has diffuse ownership, with no single identifiable individual or organization possessing the full range of knowledge. Second, the knowledge is complex. It is deeply rooted in the local context, and relates to the interaction of norms, behaviors, actions, beliefs, and culture. Third, the structure and scope of the knowledge is unclear at the outset, and can only become clearer as the *experiencing* process gets underway.

While a conducive digital culture is critical for the success of innovative digital transformation projects [29], it can be extremely difficult for an organization to define and shape the digital culture that is required. Even though examples of organizations which have successfully leveraged on their digital culture to drive digital transformation abound, it can be difficult for organizations to learn from such successes without setting up a physical presence on-site because digital culture is often rooted locally and exists only in informal norms or social interactions.

In our case study on g&m we observed that when the firm embarked on a digital transformation journey from a paper bound agency to an online broker and aggregator with a focus on providing more efficient and relevant services to its customers, the firm had to revamp its existing culture. Frequent meetings with the management team were held for all employees across departments to ensure buy-in from all departments and teams within the organization. However, it was not possible to get buy-in from all employees in the firm, and some hard decisions had to be made to let go people who did not believe in the transformation vision. Extensive training were provided to upskill themselves to cope with various new technology applications. In another example, we note that Cisco executives in certain divisions gave up their offices so the company could create team rooms, to signal the right mind-set. The company also started allowing employees to choose the workspace and tech tools that best fit their individual roles. The CEO of the North American software provider began sending notes to employees with praises by name in customer reviews. Such acknowledgment helped the company leaders reinforce the customer-first mindset as well as provide the right motivation to employees to create a digital company culture.

4. Knowledge Coordination

An important driver of digital transformation is knowledge synchronization and dissemination through coordination within project team. Knowledge coordination involves amalgamation and synchronization of team-member knowledge and expertise [30] and is an important action in digital transformation as innovation process would usually involve distributing tasks among interdisciplinary teams of experts [31].

For knowledge coordination to happen, soliciting the support of team members is critical. By highlighting organizational vision and making clear the objectives and benefits of digital innovation, commitment to the project and trust within the team are likely to improve during digital transformation process. Gaining team members' commitment towards meeting digital innovation goals is in a way legitimizing the digital transformation initiative. With legitimacy, team members follow the digital

transformation plan voluntarily out of obligation rather than fear of punishment [32]. While one may still mobilize knowledge without gaining team members' commitment, it is highly unlikely that one can do this with agility, without the preceding process of gaining commitment. In our case study on g&m we observed that the firm had also repurposed its staffing and sought their commitment to digital transformation. It is vital to have a team that is sold on the idea of a digital transformation so that they would put their heart and soul into making such transformation successful for the company. Buy-ins from all employees can also foster an innovative culture that can drive digital transformation.

Given the highly interdependent nature of the digital innovation tasks, knowledge coordination ensures that newly constructed knowledge is put into practice in a coordinated way. As project team interacts and shares knowledge, team members are able to associate others with specific knowledge domains. This results in the combination of members' knowledge and creation of new knowledge that was previously non-existent in the team and that needs to be synchronized harmoniously to improve performance [33]. In this way, the team establishes greater understanding of its tasks and can anticipate instead of reacting, which in turn allows the team to perform in a more coordinated manner during digital transformation process [34].

Having a structure to coordinate knowledge is viewed as a necessary step for knowledge sharing and transfer [35]. This is an important issue since many organizations underestimate the importance of knowledge coordination and neglect to take steps to minimize coordination problems [36], that may hinder themselves in meeting the demands for flexibility, speed and uncertainty during digital transformation. To facilitate knowledge coordination, the process may involve making clear knowledge roles and responsibilities within the team and establishing an information structure [37].

4.1. Making Clear Knowledge Roles and Responsibilities

The first step in coordinating knowledge is to make clear knowledge roles and responsibilities (e.g., installing a knowledge champion, manager and process owner), essentially, organizing people and expertise. With clarity on knowledge roles and responsibilities, team members are able to (a) share what they know about their tasks, fine-tune and build on shared information and ideas and (b) explicitly analyze, review past events and identify possible solutions, to complete their tasks in a more effective manner [38]. In this way, the team is expected to be better able to identify knowledge gaps and unique and common knowledge available in the team and decide how and when this knowledge needs to be integrated and disseminated [36]. However, while having a coordination structure is important to knowledge utilisation and sharing, the team needs to avoid extensive layers of coordination structures so as to promote agility in the flow of knowledge during knowledge dissemination. A flat knowledge coordination structure is able to eliminate formal consultation, deliberation, and complex accountability procedures, hence, allowing bureaucracy and flexibility to co-exist [38].

In our case study on g&m we observed that the firm adopted user-driven innovation to implement process redesign and improvement in its digital transformation effort. The Managing Director and his cross-functional team underlined the actors involved in the system (customers and people inside the company). They further analysed existing data to gain insights on how customers made insurance policy purchase decisions and map the user experience from the time the individual started thinking about buying insurance all the way through the actual purchase of the insurance policy. The process has allowed g&m to map the data to respective process owners who were tasked to learn and share what they knew about their customers and their purchasing behaviors. These knowledge owners could rely on the data analytics dashboard to review past buying transactions and identify possible improvements, so as to complete their tasks in a more effective manner.

4.2. Managing Information Flow and Synthesizing Relevant Knowledge

Related to the knowledge roles and responsibilities is the information structure within the team. Information structure refers to the protocol for information gathering, sharing and transparency across the disparate team members. Setting up an information structure is important as the structure promotes a communication protocol that enhances the team's agility in mobilizing its knowledge and expertise. A knowledge coordination process is likely to involve extensive verbal communication (i.e., information exchange) [31]. Such information exchange may create new knowledge if information can be translated into knowledge that team members can use [36].

By synthesizing the information collected and keeping it transparent, team members would pay close attention to the overall information flow and extract knowledge and information that may affect their own functioning in the project [28]. And by setting up a policy of keeping knowledge and information transparent at all times, team members are fully aware of the project progress and the significance of individual contribution in the digital transformation project, and this in turn, strengthens team members' commitment to the project. However, it is important to note that information transparency practice and an open culture are critical in an information structure as they may promote agility in mobilizing team members and their expertise during digital transformation.

In our case study on g&m we observed that the firm was keen to join the digital transformation bandwagon which involved digitalization of entire value chain from sales and distribution to product development, and underwriting and claims management, essentially moving from traditional face-to-face channels to digital platforms. Leveraging automation could improve efficiency in agent productivity

and document handling processes. For instance, enabling employees with remote digital tools provides real-time data which empower them to quickly take action – from quoting prospects to providing policy details and managing claims for existing customers, especially when they needed it most—brokers required next-gen customer engagement solutions in order to maximize real customer lifetime value. Improvements achieved through the deployment of technology and making data available could create significant gains in operational efficiency and revenue per employee.

5. Facilitating Knowledge Driven Agile Innovation

Digital transformation is the application of digital capabilities to processes, products and assets to enhance efficiency, increase customer value, and navigate through new revenue generation opportunities. To adapt, companies must fundamentally change the way they operate, be willing to accept change and rethink their status quo. To drive innovation in the deployment of knowledge, we have outlined three different types of knowledge and how they should each be accessed and coordinated that constitute an agile approach to innovation. Figure 1 presents our model of how knowledge management in agile innovation can drive digital transformation. The knowledge management process involves *attracting explicit knowledge*, *foraying for embedded knowledge* and *experiencing existential knowledge*, coordinated by *making clear knowledge roles and responsibilities* and *managing information flow and synthesizing relevant knowledge*. To gain the real benefits of agile innovation, organizations need to employ the different modes of access we have outlined to meet different knowledge requirements. This will enable companies to access the widest possible range of knowledge inputs in the most efficient manner.

While it is important for agile innovation organization to adopt and deploy knowledge management process outlined in Figure 1, it has to ensure amalgamation and synchronization of employees' knowledge and expertise are put in place, which may enhance the organization's distribution of tasks among its interdisciplinary teams of experts. Besides coordinating knowledge, an organization may want to improve knowledge by setting in place a system for continuous improvement of the routinized activities by configuring organizational knowledge that generates new ways of developing organizational capabilities. This is crucial to renewal and development of organizational routines especially since repeated practice and incremental learning from day-to-day operation may eventually lead to capabilities that are complex, difficult to imitate, and responsive to change. Regular feedback and discussions among employees may further enhance knowledge rationalization, before new capability is activated and routinized throughout the organization.

To facilitate knowledge-driven agile innovation, we have identified several people management practices from our case examples that may facilitate knowledge sharing behaviors during digital transformation (refer to Table 1).

Table 1. *People Management Practices Proposed to Foster Knowledge Sharing during Digital Innovation.*

People Management Practice	Description	Case Example
Set up Working Teams	Design work around teams would encourage team members to work closely together and share knowledge within the team.	g&m established a small team of marketing experts who forayed into existing knowledge by assessing existing data and analyzing content to determine the products the company could focus on for future growth. The Managing Director of g&m and his cross-functional team mapped business data to respective process owners who were tasked to learn and share what they knew about their customers and their purchasing behaviours. These knowledge owners relied on the data analytics dashboard to review past buying transactions and identified possible improvements, so as to complete their tasks in a more effective manner.
Collaborate with External Knowledge Partner	Knowledge partnership with external organizations that shares a purpose or common goal and whose members contribute knowledge, experience, and participate in two-way communications.	Phillips worked with institutions and enterprises to design healthcare services of the future. The collaboration allowed Phillips to develop new business models that enabled out of the box innovation and specialized medical services.
Design Person-organizational fit	Instil a hiring and retention practice that emphasizes the compatitity between organizational goals and employees' beliefs. This creates a community of shared values and encourages knowledge sharing.	g&m repurposed its staffing and sought their commitment to digital transformation. Some hard decisions had to be made to let go of people who did not believe in the business transformation vision. It was important to obtain buy-ins from all employees so as to foster an innovative culture that could drive digital transformation.
Provide Extensive Training to Use Technology	Training in the use of technological tools may help people to use the systems more efficiently and thus further reduces the perception of cost.	g&m provided extensive training to upskill its staff so that they could cope with various new technology applications during its digital transformation journey.
Organize Formalized Orientation and Socialization Programmes	Increase socialization among employees in a formal approach may result in shared language, closer interpersonal ties, and shared norms that positively improves knowledge sharing.	CISCO's executives in certain divisions gave up their offices so that the company could create team rooms that provided the right motivation for employees to innovate.

People Management Practice	Description	Case Example
Cultivate Knowledge-sharing Norms	Knowledge-sharing norms are created and sustained through socialization process, storytelling and ritual.	Besides analyzing historical data, g&m allowed new ideas to flow in, without having a preferential treatment of existing data. Moreover, the focus was on sections of new markets where the company had existing expertise to serve the market that was still lowly penetrated.
Engender a Culture of Trust and Cooperation	Having an open and trusting culture improves individuals' willingness to share what they know.	The CEO of CISCO sent notes to employees with praises by name in customer reviews. Such acknowledgment provided the right motivation for employees to create a digital company culture.
Adopt user-friendly IT	To reduce the perceived cost of sharing knowledge is to have a well-designed, user-friendly technological tool that simplifies the task and reduces the time necessary for knwoledge sharing.	CISCO allowed employees to choose the workspace and tech tools that best fit their individual role. g&m enabled employees with remote digital tools, providing real-time data which empowered them to quickly take action – from quoting prospects to providing policy details and managing claims for existing customers. Improvements achieved through the deployment of technology and making data available could create significant gains in operational efficiency and revenue per employee.

Organizations must be serious in coordinating and deploying its knowledge when building agility in innovation. If not, organizations may find it increasingly difficult to access the dispersed existential and embedded knowledge that is key to remain agile. It is also clear that people management practices play an important role in ensuring agile innovation takes place smoothly during digital innovation.

6. Conclusion

Digital transformation can arise from the distribution of tasks among interdisciplinary teams of experts. In this regard, one important aspect that determines the success of digital transformation is an organization's ability to innovate in an agile manner. In this article, we identify three key drivers of digital transformation. These include organizational agility, knowledge management and innovation. Another important area of knowledge management is the ability of organizations to coordinate knowledge. Knowledge coordination is particularly important for organizations because the lack of coordination can prevent them from meeting the demands for flexibility and speed during digital transformation.

We examine these issues by presenting a model to establish how agile knowledge management practices can foster innovation in an organization's digital transformation. Our model further illustrates how knowledge coordination can play a role in creating an environment that is promotes organizational agility. To facilitate knowledge-driven agile innovation, we further highlight several people management practices that can play a role in fostering knowledge sharing behaviors during digital transformation. We additionally illustrate how agile innovation can play a key role in the knowledge management aspect of an organization's digital transformation using case studies, including that of General & Marine Agents Pte Ltd, an insurance broker headquartered in Singapore.

Appendix

Case Study: Digital Transformation of g&m

In late 2020, the Managing Director of General & Marine Agents Pte Ltd (g&m), contemplated on whether there was a sure-shot way of understanding consumer behaviour and tapping on it to improve business. He had just concluded a meeting with his senior management team to brainstorm ideas on segregating the most feasible solutions that they could start focussing on to enable digitalisation within their organisation by developing an online insurance aggregator platform and sourcing technology tools to help sell insurance products online.

g&m was an insurance brokerage in Singapore and a market leader in Motor Insurance products. The firm had started to digitalise some of its activities in 2019 and intended to launch an online portal providing insurance products towards the end of 2021. The push towards digitalization had been triggered by two things. Firstly, the insurance market had started to see changes with online Insurance companies like FWD seeing rapid growth amidst a changing consumer mind-set. Secondly, super apps from platform companies such as Grab were emerging as active insurance sales channels and transforming into integrated financial services platforms. Thirdly, the pandemic COVID-19 had affected traditional delivery of Insurance, and companies had to switch quickly to online delivery of services to cope with changing circumstances.

g&m had taken its first step towards digitalization in 2013, when it had computerised all its existing paper data and started targeting a niche sector (motor insurance) to establish itself as a long haul player in the Singapore Insurance market. The company then went on a dealership spree, building key partnerships to acquire more clients and expand its market share and revenue. As g&m acquired more clients, the company started accumulating more data. At that point, the company's Managing Director realised that he would need to incorporate more digital tools to further expand his business and cater to his existing clients more efficiently, and therefore started looking at new ways in which he could incorporate digital efficiency within the organization. For starters, he engaged KPMG and implemented the lean methodology in his firm's workflow processes. The process redesign effort's key goals and objectives were to reduce and eliminate duplicate and parallel functions at the enterprise, business unit and individual job levels. It also involved minimizing labor-intensive tasks and processes and rationalizing manual workloads, improving the utilization of the existing

infrastructure and functionalities, and developing a transparent and coherent enterprise operation model focused on unified processes that collated and sorted all knowledge across the organization at an enterprise level.

Such enterprise level visibility of all knowledge, allowed the firm to introduce many innovations to improve efficiency. For example, the company was able to introduce simplified processes for car insurance products, where the total risk/portfolio of an individual for all their car insurances was assessed instead of looking at individual policies, allowing to create policies with lower premiums and better pricing.. The company also started working on plans to automate the manual submission of claims through online channels.

The Managing Director and his team held discussions to figure out what could be the best possible approach. There were several observations and considerations. Firstly, brokers were in a unique position as the trusted advisors, who gave independent advice and had expert knowledge of various insurance products and associated risks. InsurTech startups had tried to take over this unique customer relationship from brokers but had found it quite difficult to market their new products directly online. Secondly, customers still preferred personal contact during certain stages of the process. On the other hand, customers also preferred time-saving digital solutions at other times. Customers were no longer inclined to drive to their broker for administrative matters. g&m realized that it had to consider striking the right balance between physical and digital contact and become an indispensable link in the hybrid story. Thirdly, some brokers had chosen to collaborate with Fintech startups to become a technology provider for the insurance market by simplifying the back-office of brokers and insurers and facilitating the exchange of data or building a platform that other systems could plug into. Fourthly, there were risks to assess and consider due to the digitalization of services across sectors. On the one hand, brokers would radically need to change their approach because of new technologies. On the other hand, digitalization created new and more complex insurance products like an insurance for cyber risks or insurance for risks associated with the sharing economy. For example, if a customer wanted to charge his electric car using power from his neighbor's solar panels, he would look for an insurance policy that covered both parties. Finally, digital marketing was expected to become a part of every broker's job, and a growing number of brokers had invested in a website that was search engine optimized with a social media presence.

To make the transition into a digitally enabled insurance broker, g&m knew that it was very vital to actively think about the best possible outcome. The Managing Director spent several sessions brainstorming over their digitalization strategy moving forward. There were a few obvious requirements that the whole team was convinced the company would require. They started with underlining the actors involved in the system (customers and people inside the company) by using design thinking and creative facilitation as methods and performed one-to-one interviews with customers of the company to understand what kind of technology could better serve their needs. They also started investigating their approach to understand their existing data to gain insights on how customers made insurance policy purchase decisions and map the user experience from the time the individual started thinking about buying insurance all the way through the actual purchase of the insurance policy. They realized that they would need to build two solutions for starters – one would be a model to perform market basket analysis, and another to build customer segmentation. The models would need to address questions like - which products were typically purchased together? Who were the high-value customers that g&m could focus more efforts on, and could these efforts be personalized according to their characteristics?

The other idea that was floated during the discussions was to build a financial dashboard that could inform the Managing Director and his team of significant increases in costs as the business expanded. Given that g&m did not have any dashboards to notify management on whether its plans were on track, there was a need to analyze financials deeper and understand performance metrics better through insightful visualizations. Additionally, the team also wanted to develop predictive models for the purpose of cross-selling/up-selling of their insurance products. The fundamental objective was to grow revenue and customer base through cross-selling/up-selling. Such tools could be particularly helpful in aiding the firm to expand its business in new market segments like SME's, as per the company's growth targets.

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