Implementing Digital Transformation Through the Project Management Office

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Approved: June 2, 2020

Submitted in partial fulfillment of the requirements for the degree of Master of Science in Project Management, The College of St. Scholastica, Duluth, Minnesota.

Abstract

Digital transformation offers potential benefits to projectized organizations, but such transformation is limited, and there is no model for using the project management office (PMO) for digital transformation work. To address this issue, scholarly literature on digital transformation, projectized organizations, and PMOs was examined. From this review it is evident that the fast pace of digital technology development, the organizational scope of digital transformation, lack of digital skills, and resource availability are key challenges for digital transformation in projectized organizations. Promising practices include the use of digital hubs, benefits realization, and design thinking. This review also made clear the alignment between PMO role and digital transformation work in projectized organizations. Synthesizing scholarly literature led to the creation of a model of the PMO as the hub of digital project management. The model presented consists of three distinct paths towards digital transformation based on an assessment of organizational type. Additionally, a projectized organization should follow the outlined implementation plan to establish this model. Key limitations of this model are that it does not provide a mechanism for increasing organizational readiness, that it was not developed for situations where there are multiple PMOs, and that it has not been studied in practice.

Keywords: Digital transformation, project management offices, digital skills, design thinking, benefits realization

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Introduction

Current digital innovation offers significant opportunities for organizations to increase efficiency, enhance productivity, and reduce costs (Didehvar, Teymourifard, Mojtahedi, & Sepasgozar, 2018). According to Witschel, Döhla, Kaiser, Voigt, and Pfletschinger (2019), organizations are not deciding whether or not to employ digital innovation but rather how to do so. Instances of such digital innovation abound, such as building information modeling (BIM), artificial intelligence, and the Internet of Things. For example, BIM provides digital management of the construction project lifecycle (Wang, Pan, & Luo, 2019). BIM is considered revolutionary for the construction industry since it offers digital simulation and stores shared project knowledge, facilitating collaboration on complex projects (Koseoglu, Keskin, & Ozorhon, 2019). Artificial intelligence is a developing innovation with the current ability to process digital data quickly to identify patterns and support decision making (Walker & Lloyd-Walker, 2019). In the future, artificial intelligence is likely to have even greater ability to process and respond to information in and about projects (Auth, Jokisch, & Dürk, 2019). The Internet of Things enables real-time data collection through smart devices, useful for monitoring and decision-making (Sousa & Rocha, 2019). When applied, digital technology can deliver better-performing products (Sánchez & Zuntini, 2018) and business value (Morgan, 2019; Sousa & Rocha, 2019). The successful, organization-wide use of digital innovation for business value is known as digital transformation (Sousa & Rocha, 2019; Orji, 2019). This study examines the merits and challenges of digital transformation for projectized organizations. Based on that evaluation, this study provides a framework for leveraging a common structure, the project management office (PMO), to implement digital transformation. The purpose of implementing

digital transformation through the PMO is to improve the projectized organization's ability to manage projects in the digital era.

Projectized organizations, also called project-based or project-oriented organizations, are businesses whose fundamental mission is accomplished through projects (Gemünden, Lehner, & Kock, 2018). The projectized organizational structure is in contrast to a traditional structure where work is accomplished through functional departments (Aubry et al., 2007). Examples of typically projectized organizations are construction companies, engineering firms, and consulting companies. However, many types organization can be considered projectized, if projects are the primary mechanisms of value production for the company (Aubry et al., 2007). Since projectized organizations are grounded in short-term endeavors, these organizations are considered more flexible and thus better able to innovate (Gemünden et al., 2018). This type of organizational structure first became common in the 1990s and has since become increasingly popular (Aubry et al., 2007; Kaul & Joslin, 2019).

The construct of the PMO is an outflow of the rise of projectized organizations and the corresponding need to manage the complexity of multiple simultaneous projects (Tshuma, Steyne, & van Waveren, 2018). The PMO is a unit within an organization that is tasked with various duties related to coordinating and managing that organization's projects (Aubry, 2015). While PMO tasks vary, the office is typically central to the organization's projects management while also spanning a variety of departments or functional areas (Aubry, 2015). PMOs in projectized organizations are usually charged with high-level management and coordination between projects (Bredillet, Tywoniak, & Tootoonchy, 2018a). PMOs play a significant role in organizational project management by providing services that support the improvement of project management practice at an organization (Müller, Drouin, & Sankaran, 2019). Since

becoming common in the 1990s, PMOs have evolved along with the needs of the organizations where they exist (Aubry et al., 2007; Braun, 2018). These needs currently include adapting to digital innovation (Hubbard & Rogers, 2018).

Digital transformation is the application of digital innovation in ways that provide value to the business and ultimately the customer (Raschke, 2018). Such innovation is not just technology itself, but rather the new or changed experiences, services, or items arising because of the capabilities of technology (Raschke, 2018). Decentralized lodging platforms (Airbnb), digital currency (Bitcoin), and mobile payment readers (Square) are examples of recent significant digital innovation (Hinings, Gegenhuber & Greenwood, 2018). In traditional fields such as construction, manufacturing, or banking, digital transformation is minimal (Chanias, Myers, & Hess, 2019). Digital transformation will be increasingly necessary to satisfy customer expectations and improve project outcomes (Whyte, 2019; Whyte, Stasis, & Lindkvist, 2016), making digital transformation necessary for managing projects in the current business environment.

In projectized organizations, the PMO is the appropriate vehicle for the digital transformation of project management because PMOs have a unique, cross-function reach, have a major role in determining and establishing best practices, and a history of evolving to fit the needs of their parent organizations (Darling & Whitty, 2016; Sandhu, Ameri, & Wikström, 2019). At projectized organizations, project management is used throughout the organization as the primary methodology for fulfilling the organization's purpose (Gemünden et al., 2018). Since PMOs guide an organization's project management (Müller et al., 2019), the PMO is thus a significant player in organization-level transformation of projectized organizations. A deeper look at this topic highlights the pressing need for digital transformation.

Introduction to the Problem

The digital business environment. The current business environment is evolving rapidly and intensely as a result of digital innovation (Orji, 2019; Sousa & Rocha, 2019; Whyte, 2019). Digital innovation and widespread internet access have led to customer expectations of higher quality products (Sousa & Rocha, 2019) and digital solutions (Koseoglu et al., 2019). Digital innovation has also impacted the core products and services of some businesses (Sousa & Rocha, 2019). Traditional industry boundaries can be blurred by new competitors who incorporate digital technology in novel ways (Sklyar, Kowalkowski, Tronvoll, & Sörhammar, 2019). This evolution has facilitated increased competition as new businesses that can innovate quickly challenge established companies (Hubbard & Rogers, 2018). Such disruption threatens organizations that are not prepared to respond (Sklyar et al., 2019). Many organizations have found it difficult to keep pace with digital innovation and the related digital disruption (Sousa & Rocha, 2019). For companies that are thriving, the ability to respond to digital innovation and keep up with competitors is the result of a combination of technical and social transformation (Cavalieri & Saisse, 2019).

Digital transformation and projectized organizations. Organizations are doing project work with new methods, and it is expected that digital innovation will impact future methods (PMI, 2018a). According to PMI (2018a), 91% of high-achieving organizations expect digital transformation to have a moderate or major impact on work. In the world of projectized organizations, various software is the main type of digital innovation currently available, with BIM being a significant standout (Whyte, 2019).

Projectized organizations using BIM and other innovation are expected to reap benefits including reduced project costs and shortened project duration (Didehvar et al., 2018; Sousa &

Rocha, 2019). Software automatically directs work processes (Whyte, 2019) thus freeing up project team time. Data visualization and related analytics uses big data to aid responsive, high-quality project decision making (Whyte et al., 2016) while smart devices support project monitoring (Whyte, 2019). In addition to being attractive because of these perceived benefits, the use of digital innovation or the delivery of innovative digital solutions may be an expectation for projectized organizations.

Projects are increasingly required to include or deliver current digital innovation such as augmented reality and integrated software systems (Whyte, 2019). Furthermore, information extracted from big data can be expected as a project deliverable (Whyte et al., 2016). Thus, adoption of digital innovation is necessary for projectized organizations' competitiveness, even if such digital innovation has a less significant impact on the cost, schedule, and quality of specific projects than expected. Adopting current digital innovation and being prepared for future digital innovation is digital transformation.

A state of digital transformation extends beyond the use of specific innovation and includes the adoption of a digital perspective that incorporates the digital, social, and knowledge-sharing backbone of digital innovation (Sousa & Rocha, 2019). In other words, digital transformation at an organization includes changes in work processes and organizational culture (Orji, 2019). Employee skills and project governance are other components that need to be reexamined for an organization to achieve digital transformation (Orji, 2019). Ultimately, digital transformation is not an on/off switch, rather it is the dynamic ability to keep up with ongoing digital innovation (Whyte, 2019). This ability to incorporate new digital innovation as such innovation appears also requires an appropriately aligned business structure (Hubbard & Rogers,

2018). Thus, digital transformation is an organizational endeavor with ongoing organizational requirements.

An organization's dynamic capabilities give it the ability to be flexible and grow in the face of market challenges (Teece, 2007). Teece (2007) identified three dynamic capabilities: sensing, seizing, and reconfiguration. All three of those dynamic capabilities have been identified as beneficial for innovation (Mousavi, Bossink, & Vliet, 2018). Particular value has been found in the dynamic capability of reconfiguration, also called alignment (Braun & Sydow, 2019). Scholars have identified the challenge of building dynamic capabilities in organizations lacking such capabilities (Warner & Wägner, 2019). Given this struggle, it is not surprising that organizations struggle with digital transformation.

The present state of digital transformation in projectized organizations varies significantly, even in the current digital era. The digital era arose from key work in the late 1940s but has had particular impact over the past twenty years (Tekic & Koroteev, 2019), as evidenced by the ubiquity of computers in work. Many organizations existing before there was significant digital integration in the economy – particularly in established industries such as construction, manufacturing, or banking – still need to move to a state of digital transformation (Chanias et al., 2019). There is widespread BIM adoption in the construction industry (Koseoglu et al., 2019; Wang et al., 2019). However, this adoption has produced limited value due to continued use of old systems, and struggles to fit this innovation into established workflow (Matthews, Love, Mewburn, Stobaus, & Ramanayaka, 2017). Additionally, the ability to use big data strategically for organizational knowledge management has been identified, but appropriate application of the data is a current challenge (Ekambaram, Sørensen, Bull-Berg, & Olsson, 2018). In megaprojects, the use of digital innovation is sometimes seen as risky (Gemünden et

al., 2018) given the rapid evolution of digital innovation in comparison with the long timelines of such projects (Whyte, 2019). It is apparent that the status of digital transformation in many projectized organizations is not ideal.

Digital transformation and benefits realization. The need to focus on generating value from projects and project management in an organization has been the subject of recent project management scholarship (Musawir, Serra, Zwikael, & Ali, 2017; Svejvig, Geraldi, & Grex, 2019). Benefits realization is concerned with creating value for the organization (Svejvig et al., 2019). Successful benefits realization management ensures projectized organizations deliver strategic benefits, not just projects that met the triple constraint of time, cost, and scope (Musawir et al., 2017). The Project Management Institute (PMI) reiterated the need to focus on benefits rather than the triple constraint (PMI, 2018a). Digital tools are purported to offer benefits, but the actual realization of those expected benefits is needed to ensure the organization receives value. The practice of benefits realization has been challenging for projectized organizations (Romero, Paré, & Khemici, 2017), but PMI published a guide with tools and direction (PMI, 2018). This guide and other benefits realization scholarship should provide insights to inform effective digital transformation through the PMO.

PMO role, responsibilities, and evolution. In projectized organizations, the PMO holds a cross-department, multi-project function (Sandhu et al, 2019; Tshuma et al., 2018). PMOs support the best practices that shape the business environment (Darling & Whitty, 2016) and participate in innovation (Artto, Kulvik, Poskela, & Turkulainen, 2011; Aubry, 2015). While often being instituted as a way to improve an organization's project outcomes, the PMO is also a structure that binds individual projects to an organization's strategic plan (Sandhu et al., 2019).

This function has enabled a PMO to achieve organizational change in response to digital innovation in at least one instance (Fister Gale, 2019). Hubbard and Rogers (2018) argued that PMOs impact the organizational ecosystem and thus advance the cultural and technical components of digital transformation. PMOs have been responsible for standardization (van der Linde & Steyn, 2016), sharing tools and techniques (van der Linde & Steyn, 2016), and providing direction for projects in order to support organizational strategic goals (Sandhu et al., 2019), useful and relevant experience for digital transformation efforts.

Despite over a decade of examination in scholarly literature, a clear definition of the PMO role and scope of PMO activities has not been established (Lacruz, Cunha, de Moura, & de Oliveira, 2019; Sandhu et al., 2019). Potential roles for the PMO include supportive and controlling (Aubry, 2015); supportive, controlling or directive (PMI, 2017); or strategic and tactical (Sandhu et al., 2019). In practice these distinctions are blurred and vary widely among organizations, though it is agreed that PMOs have evolved to fit the business needs of their parent organizations (Sandhu et al., 2019; van der Linde & Steyn, 2016) and environment (Lacruz et al., 2019).

PMOs are part of the broader organizational project management sphere and play a significant role in improving organizational project management (Müller et al., 2019). Furthermore, organizations and PMOs co-evolve together (Bredillet et al., 2018a). Ultimately, it is appropriate and valuable for PMOs to be involved in the implementation of digital transformation for projectized organizations because of the similarity between efforts to develop digital transformation and established PMO duties, the PMO's recognized function connecting organizational strategy and projects, and the history of PMO evolution to meet the needs of the organization.

Statement of the Problem

Digital transformation is the use of digital innovation as well as the adoption of a digital business perspective (Koseoglu et al., 2019; Orji, 2019; Sousa & Rocha, 2019). Digital transformation provides business benefits for projectized organizations in the face of new digitally driven competition (Chanias et al., 2019; Hubbard & Rogers, 2018; Sousa & Rocha, 2019). However, there are barriers to effective digital transformation, including high cost (Kelly & Illozor, 2019; Koseoglu et al., 2019; Sánchez & Zuntini, 2018), significant risk (Lavikka, Kallio, Casey, & Airaksinen, 2018; Martinsuo, 2019), unsupportive organizational culture (Kelly & Ilozor, 2019; Lewkowicz & Liron, 2019), lack of digital skills (Koseoglu et al., 2019), data management challenges (Ekambaram et al., 2018); and lack of standardization (Wang et al., 2019; Senyo, Liu, & Effah, 2019).

PMOs could be instrumental for implementing digital transformation given their integrative role (Sandhu et al., 2019) and continued evolution to address the organizational project management problems of the organizations where they reside (Müller et al., 2019; Sandhu et al., 2019; van der Linde & Steyn, 2016). However, a model for digital transformation via the PMO does not exist (Cavalieri & Saisse, 2019). Such a model is necessary for projectized organizations to adopt digital transformation and thus be able to manage projects in digital business environments.

Purpose of the Study

The purpose of this study is to provide project management offices with a framework for implementing and institutionalizing digital transformation in projectized organizations to support the realization of business benefits from digital innovation, meet the competitive demand for digital innovation, and equip projectized organizations to manage digital projects of the future.

Management Question

That purpose will be achieved by synthesizing how project management offices operate with the process of digital transformation. A mechanism for digital transformation through the project management office must be developed. Thus, the central question this study seeks to answer is: How does the project management office implement and institutionalize digital transformation in projectized organizations?

Research Questions

Constructing a model of digital transformation via the PMO will require a thorough understanding and synthesis of scholarly literature on digital transformation, the scope and details of digital transformation challenges, promising practices for digital transformation, and PMOs. These research questions were identified to direct a literature review.

- What are the main components of digital transformation?
- What benefit does digital transformation offer projectized organizations?
- What is the current state of digital transformation in projectized organizations?
- What are the barriers to digital transformation?
- What are support factors for digital transformation?
- How can benefits realization practices inform digital transformation efforts?
- What is the role of the project management office in a projectized organization?
- Which project management office role is most suitable for digital transformation efforts?

Significance of the Study

Digital innovation will continue to pervade and change the business world. This study will present a framework for projectized organizations with PMOs to leverage that organizational

structure to respond to digital innovation by adopting digital transformation. This work will contribute to the research on the ongoing evolution of PMO roles and duties based on the needs of their parent organization (Sandhu et al., 2019; van der Linde & Steyn, 2016) by providing a tool for PMOs to respond to the need for digital transformation in projectized organizations (Hubbard & Rogers, 2018). Furthermore, this work will contribute to the literature on organizational project management by showing the role of the PMO in a projectized organization's digital transformation strategy.

Organization of the Study

This study consists of a literature review examining the essence of digital transformation, dynamic capabilities for digital transformation, reasons for digital transformation, digital transformation in projectized organizations, barriers, support factors, benefits realization, the essence of PMOs, PMO types and roles, and the use of PMOs in strategic change work. Additionally, this study includes a discussion of the proposed framework for adopting digital transformation through the PMO and a presentation of an implementation methodology for this framework. Assumptions, limitations, and opportunities for further research are also examined.

Literature Review

Digital transformation is a popular but imprecise concept that has a variety of interpretations and applications (Warner & Wäger, 2019). To understand what it means for pre-digital projectized organizations and how it can be achieved through the PMO required a thorough examination of relevant scholarly works. Scholarly literature examining digital transformation, benefits realization, and the PMO was included in this review. Investigating these areas will establish what constitutes digital transformation and how digital transformation is adopted at an organization. This foundation, when combined with an understanding of the PMO's activities and role, should guide projectized organizations in leveraging the pre-existing PMO structure to facilitate the adoption of digital transformation in the pursuit of competitive advantage.

Digital transformation is the application of digital technology and corresponding organizational changes that generate value for organizations (Chanias et al., 2019; Sklyar et al., 2019). Digital transformation is uniquely challenging because of the many components involved, the organizational scope of such efforts, the ongoing nature of this work, and the speed of technology development. Digital transformation includes combining digital innovation or combining digital and physical components to create new types of services or products (Hinings et al., 2018). The potential emergence of new services or products points to the organizational impact of digital transformation. Because of this level of impact, widespread organizational involvement in digital transformation is necessary (Morgan, 2019). In addition to involving the whole organization, digital transformation is ongoing due to the continued evolution of digital technology (Warner & Wäger, 2019).

When it comes to initially achieving a state of digital transformation, several helpful considerations emerged from this review. Organizations are motivated to engage in digital transformation due to customer demand and desire to remain competitive (Pramanik, Kirtania, & Pani, 2019). The appropriate path to digital transformation for a specific organization will depend on organizational readiness and technology proficiency (Tekic & Koroteev, 2019). Dynamic capabilities support organizations on the path to digital transformation (Warner & Wäger, 2019).

Examining digital transformation in projectized organization showed significant discussion of potential but limited application. Big data and AI have been touted as beneficial for project management, but only conceptually (Auth et al., 2019; Ekambaram, et al., 2018). Also, organizations in the architecture, engineering, and construction fields have tried to protect themselves from digital disruption rather than embrace digital transformation (Lavikka et al., 2018). In addition, there is a recognized lack of project management models for digital transformation (Cavalieri & Saisse, 2019).

A review of barriers to digital transformation showcased the challenges projectized organizations have to overcome. The barriers to digital transformation include the cost of digital technology (Kelly & Illozor, 2019), the risk associated with digital transformation (Lavikka et al., 2018), the lack of a supportive organizational culture (Kelly & Ilozor, 2019), the absence of digital skills (Koseoglu et al., 2019), the difficulty of data management (Ekambaram et al., 2018), and the challenge of standardization (Wang et al., 2019). A review of support factors for digital transformation pointed out potential first steps for organizations adopting digital transformation. Support factors include the use of digital transformation strategies (Chanias et

al., 2019), support from an organization's leadership (Morgan, 2019), and the implementation of digital hubs (Guinan, Parise, & Langowitz, 2019).

The effort needed to address barriers and develop support factors is presumably only worthwhile if an organization will gain value from digital transformation. Benefits realization management is the project management sub-discipline concerned with generating value (PMI, 2018c). Benefits realization scholarship offers models and tools that a projectized organization could follow to ensure digital efforts provide value. Because benefits realization extends beyond a single project, project governance such as the PMO plays a key role (PMI, 2018c).

Examining the PMO revealed key qualities, which make the PMO appropriate for digital transformation. PMOs do boundary-spanning work across projects and functional areas of an organization (Aubry et al., 2007; Artto et al, 2011), have a multi-project domain (Aubry & Brunet, 2016), and hold responsibility for coordination (Braun, 2018). Additionally, PMOs establish best practices (Darling & Whitty, 2016) and transfer knowledge among projects (Lacruz et al., 2019). PMOs evolve frequently based on the current needs of the organization (Bredillet et al., 2018a) or a desire to prove their value to their parent organization (Darling & Whitty, 2016). Thus, because projectized organizations need to adopt digital transformation, and adopting digital transformation supports the achievement of organizational project management maturity (PMI, 2018b), PMOs are appropriate vehicles for digital transformation. The factors examined in this review of scholarly literature will inform the creation of a solution, which presents a framework and tools for such digital transformation through the PMO.

Digital Transformation

Introducing digital transformation. The definition of "digital transformation" varies, with executives using the term to mean everything from strategic change efforts to operational

activities such as digital marketing (Warner & Wäger, 2019). For the purposes of this study, digital transformation is defined as the novel use of digital technology and related changes to business structure or processes to achieve value (Chanias et al., 2019; Sklyar et al., 2019). The key technology components of digital transformation include AI, big data, cloud computing, the Internet of Things, mobile computing, and social media (Guinan et al., 2019; Sánchez & Zuntini, 2018). This technology is significant because it allows real-time impact (Bauer, Schlund, Hornung, & Schuler, 2018) and facilitates effortless transfer of information (Hinings et al., 2018). Such technology blurs the distinction between the material and immaterial (Moreira, Ferreira, & Seruca, 2018; Tekic & Koroteev, 2019). For instance, traditionally physical objects may now include digital components. A key example is the proliferation of internet-connected smart devices (Warner & Wäger, 2019) such as smart light bulbs or smart refrigerators.

Smart devices are a simple example of the combination of innovation, networks, services, and people, which result from digital transformation (Cavalieri & Saisse, 2019). Digital transformation is exemplified when several digital innovations are combined to create something new and present a challenge to the current way of doing things (Hinings et al., 2018). Ridesharing applications are a specific example of this new innovation and disruption. These applications require the combination of mobile internet-connected devices, GPS, and mobile payment technology; any of this technology alone would not be sufficient. So, organizational digital transformation entails proficiency in combining digital technology (Zaki, 2019).

Additionally, digital transformation is defined by the organizational scope of impact expected. Digital transformation is organizational in nature (Morgan, 2019). Digital transformation could involve refashioning the organization (Moreira et al. 2018). Changes to digital business could impact an organization's business model, such as by enabling different

revenue options, such as subscriptions (Witschel et al., 2019). In the cases studied by Witschel et al. (2019), successful adaptation to digital business involved new or hybrid business models. Chanias et al. (2019) also emphasized the organizational nature of digital transformation since individuals from across an organization are likely to be involved in the work of digital transformation. Thus, it is apparent that digital transformation is organizational and not relegated to a single functional unit.

Furthermore, digital transformation is continuous in nature. Digital transformation is ongoing, and final digital proficiency cannot be achieved, since new technology and driving factors will emerge (Warner & Wäger, 2019). In a case study of digital transformation, Chanias et al. (2019) found it to be a continuous cycle, alternating between periods of discovery and application. Alternating between identifying uses for new technology and applying those uses allows for improvement that is ongoing but meaningful, as Chanias et al. (2019) identified. One main factor necessitating ongoing discovery periods is the continuous advancement of digital technology.

Such technology is evolving quickly (Zaki, 2019), and that speed has implications for organizations who want to maintain digital transformation. Scholars note the rapid speed of digital development as a distinctive environmental force surrounding digital transformation (Bauer et al., 2018; Hubbard & Rogers, 2018; Zaki, 2019). Unexpected changes come quickly, making it difficult for organizations to forecast and prepare for the next great innovation (Lavikka et al., 2018). Thus, digital transformation requires organizational agility (Holgeid, Stray, Krogstie, & Thompson, 2018; Moreira et al., 2018).

The rapid pace of digital technology development reinforces the conclusion that digital transformation is uniquely challenging (Altukhova, Vasileva, & Yemelyanov, 2018; Ekambaram

et al., 2018; Warner & Wäger, 2019; Zaki, 2019). Warner and Wäger (2019) argued, based on seven case studies of German firms, that digital transformation is distinct from other strategic change because of the scalability possible through digital innovation. Zaki (2019) noted that digital transformation is distinctly more demanding. It goes beyond using digital technology for efficiency, as has been done with past technology, to the creation of new services and systems (Zaki, 2019). Furthermore, the uncertainty of digital transformation adds to its challenging nature (Chanias et al., 2019). A specific example is found in the case of Volvo, which had to deal with four significant challenges while adopting digital transformation: (1) building capacity for innovation without taking resources away from the capacity of specialized units, (2) maintaining equilibrium between product innovation and process innovation, (3) using external resources while maintaining the value of internal resources, and (4) finding a middle ground between governance flexibility and control (Svahn, Mathiassen, & Lindgren, 2017). In the face of challenges such as these, the question remains of why organizations chose to pursue digital transformation.

Reasons for digital transformation. A primary motivating factor behind organizational digital transformation is response to customer expectations. Customers increasingly expect digital products and digital solutions (Pramanik et al., 2019). The banking institutions studied by Pramanik et al. (2019) emphasized the fast-growing use of digital and mobile applications, and that customers who used these were more engaged. One of the organizations examined by Witschel et al. (2019) was also directly motivated by changing customer requirements while another cited fear of customer loss due to lack of digital solutions as a reason for digital transformation. Digital transformation of the organization is necessary to address customer expectations for personalized digital products and services (Bauer et al., 2018). Overall, the

increased focus on customer expectations is major motivating trend for digital transformation efforts at organizations (Altukhova et al., 2018).

The risk of losing competitive advantage is also a primary motivation for organizations to adopt digital transformation (Pramanik et al., 2019). Given the customer preference for digital, the banking institutions studied by Pramanik et al. (2019) feared that falling behind the digital revolution would lead to the loss of customers. This fear has merit, given developments in other industries. The emergence of digital platform-based businesses has disrupted established businesses in industries including hotels (Airbnb) and retail (Amazon) (Sánchez & Zuntini, 2018). According to Bauer et al. (2018), the two main factors of maintaining competitive advantage are using digital technology to solve an existing problem and creating a unique innovation that sets an organization apart from competitors. Solving existing problems could include using digital solutions to reduce costs or increase the speed of processes (Cavalieri & Saisse, 2019). New innovation could take unlimited forms, from a new cloud-based application to the use of smart technology in new types of physical objects. Innovating at this level is valuable, but it may not be a necessary component of an organization's digital transformation strategy.

Tekic and Koroteev (2019) proposed four types of digital transformation strategies, ranging from disruptive transformation to proudly analog transformation. These four types align with four organization types as determined by a matrix view of organizational readiness and technology proficiency. Disruptive transformation, addressing high organizational readiness and high technology proficiency, focuses on changes in business model and the emergence of new business models. Business-model-led transformation, addressing high organizational readiness and low technology proficiency, focuses on identifying and exploiting digital opportunities.

Technology-led transformation, addressing low organizational readiness and high technology proficiency, focuses on efficiency and leveraging benefits from individual applications of digital technology. Finally, proudly analog transformation, addressing low organizational readiness and low technology proficiency, focuses on minor gains from digital technology that do not impact the essence of the business. While not applied to case studies or studied empirically, Tekic and Koroteev's (2019) conceptualization of organization types and appropriate strategies for these types provides a beneficial way to differentiate the need for digital transformation in different business environments. Regardless of the type of digital transformation required, common threads emerge of finding and applying digital innovation, work addressed by the concept of dynamic organizational capabilities.

Digital transformation and dynamic capabilities. Dynamic capabilities are strategic organizational capabilities, in contrast to operational capabilities (Lobo & Whyte, 2017; Orji, 2019; Sánchez & Zuntini, 2018). Dynamic capabilities enable organizations to respond quickly and adjust to changes (Lacruz et al., 2019). Teece (2007) identified the categories of sensing, seizing, and reconfiguration as the dynamic organizational capabilities needed for sustaining market survival. Sensing involves recognizing opportunities, seizing involves responding to those opportunities, and reconfiguration involves reorienting the organization in line with its environment (Mousavi et al., 2018). This categorization by Teece has shaped continued scholarship on dynamic capabilities (Kump, Englemann, Kessler, & Schweiger, 2019).

Lobo and Whyte (2017) identified the dynamic organizational capabilities of alignment and reconciliation as necessary for building the project capability of digital delivery. Mousavi et al. (2018) found that all three of Teece's categories of dynamic capabilities contributed to innovation, however this finding was based on data collected in 2009, before many key

components of digital transformation gained traction. Braun and Sydow (2019) also highlighted alignment as helpful for digital transformation, specifically alignment among technology, organizational structure, processes, and connections. Warner and Wäger (2019) determined that the ability to work in innovation ecosystems, overhaul organizational form, and achieve higher digital maturity were vital dynamic capabilities for digital transformation.

Challenges surrounding the concept of dynamic capabilities have been identified in recent scholarship. Lobo and Whyte (2017) noted that how to build dynamic capabilities for digital transformation remains unclear. While Braun and Sydow (2019) pointed to the dynamic capability of alignment as central in the BIM context they studied, they did not address how to build this capability. Warner and Wäger (2019) attempted to provide insights on building dynamic capabilities by analyzing seven large German companies undergoing digital transformation. They identified cross-functional teams, rapid decision making, and leadership support as catalysts for the development of dynamic capabilities (Warner & Wäger, 2019). Although Warner and Wäger (2019) provided direction for building dynamic capabilities, determining if an organization needs to build dynamic capabilities or has sufficient capabilities already is another issue.

Kump et al. (2019) noted a lack of standardized measurement tools for dynamic capabilities and presented a scale based on the work of Teece (2007) that was designed to aid conceptual development and comparison of findings related to dynamic capabilities. This 14-factor scale included components addressing outcomes related to environmental awareness, innovation capacity, and change ability (Kump et al., 2019). Although potentially useful, the authors acknowledged that future refinement of their scale is needed (Kump et al., 2019). The number of inter-related factors identified in the work of Kump et al. (2019) illustrated the

complexity of dynamic capabilities, highlighting the challenge facing organizations, which seek to pursue digital transformation by enhancing the organization's dynamic capabilities.

An additional challenge is determining how dynamic capabilities interact with other organizational factors. Fainshmidt, Wenger, Pezeshkan, and Mallon (2019) surveyed organization leaders and found that the availability of resources aided the deployment of dynamic capabilities in response to change. Moreover, resource availability played such a significant role in an organization's ability to respond to changing environments that Fainshmidt et al. (2019) postulated that resource availability was always necessary for change while dynamic capabilities were only needed in some situations. Dynamic capabilities and resource availability aid organizations on their journey to digital transformation, a journey that many projectized organizations have barely begun.

Digital Transformation in Projectized Organizations

The potential benefits of digital technology and digital transformation in terms of competitive advantage for projectized organizations have been claimed (Didehvar et al., 2018; Hubbard & Rogers, 2018; Morgan, 2019; Wang et al., 2019), but actual adoption lags substantially. For example, Ekambaram et al. (2018) described the potential for the use of big data in project management, but their work was conceptual. Additionally, intelligent technology is able to provide monitoring (Martinsuo, 2019) and robotic automation can complete simple, repetitive tasks in project monitoring and reporting, but project management is not a specific area where robotics development has focused (Auth et al., 2019).

This disconnect between potential and reality for projectized organizations is particularly noticeable with AI. The consideration of AI use in project management has reemerged recently because the amount of data availability and processing speed (Auth et al., 2019). PMI

highlighted AI's potential in the 2019 *Pulse of the Profession: AI @ work: New Projects, New Thinking*. However, the report primarily focused on the future of AI and expected growth and even acknowledged that organizations need to determine the appropriate AI technology to support their aims (PMI, 2019). Another example of the potential around AI in project management is represented in the work of Abdellatif, Capretz, and Ho (2019) who applied an information retrieval model to automatically select relevant lessons learned instead of requiring manual searching (Abdellatif et al., 2019). They noted that their work was the first they were aware of to apply information retrieval models for lessons learned and suggested a variety of future work including the incorporation of natural language processing (Abdellatif et al., 2019). While promising, those suggestions for future research highlight the nascent stage of AI application in project management. While a significant and increasing amount of project management work is possible through AI, actual software or systems for using AI are currently lacking (Auth et al., 2019). This literature on AI in project management illustrates the common gap between potential benefits and actual value when it comes to digital transformation.

Digital project teams, teams that are agile and composed of members from across IT and other functions, have been investigated, and while supporting factors were identified, widespread diffusion of digital teams was not (Guinan et al., 2019). Guinan et al. (2019) examined how to create a digital project team to support digital transformation. In studying IT teams at 60 companies they identified four team-based factors that supported digital transformation. These factors were varied and strategic team makeup, repeated goal setting, focus on ongoing learning, and human resource management (Guinan et al., 2019). While this insight is helpful for developing digital strategy, the study did not show widespread evidence of the ideal teams described. Many companies were not prepared for digital transformation in the authors' view

(Guinan et al., 2019). Considering that Guinan et al. (2019) examined project teams in the IT industry, it seems reasonable that their determination remains true or is more pronounced in other projectized organizations less centered around technology.

Other examples drive home the weak state of digital transformation in projectized organizations. Established businesses in the architecture, engineering, and construction have sought to protect their business process instead of changing them (Lavikka et al., 2018). Only 23 percent of projects include some AI component for project management (PMI, 2019), and that percent would include organizations founded in the digital era. Additionally, despite digital potential, major companies still use traditional change management processes (Whyte, Stasis, & Lindkvist, 2016). Overall, the state of digital transformation in projectized organizations is not ideal.

This reflects the lack of clear frameworks for digital transformation in projectized organizations. Cavalieri and Saisse (2019) found no project management models for implementing digital transformation in their review of recent literature. Even broadly, outside of the field of project management, there is a lack of systems to guide digital transformation implementation (Ifenthaler & Egloffstein, 2020; Moreira et al., 2018; Witschel et al., 2019). Although clear frameworks are lacking, one innovation process, design thinking, has gained traction in project management literature and presents potential for achieving digital transformation.

Design thinking. Design thinking is a method of approaching unclear situations that brings the perspective of design into business settings (Mahmoud-Jouini, Midler, & Silberzahn, 2016). In other words, design thinking includes various approaches that involve the developer thinking and learning about the customer's needs and incorporating feedback from customers

into solutions as the solutions are being created (Guinan et al., 2019). Close connection between concept and result is a hallmark of the method (Albaidhani & Torres, 2018). The use of design thinking in business settings was originally centered around its use in management, where the concept gained significant attention in the 2000s and early 2010s (Mahmoud-Jouini et al., 2016).

Mahmoud-Jouini et al. (2016) introduced design thinking to the world of project management and advocated for the use of design thinking for three purposes: exploring highly uncertain project contexts, engaging stakeholders to address their real expectations, and emphasizing the strategic value of each project. They presented 10 propositions about the value of using design thinking in project management and called for future empirical research (Mahmoud-Jounini et al., 2016). Although the work of Mahmoud-Jouini et al. (2016) pointed to connections between design thinking and project management, that work did not create a comprehensive model (Albaidhani & Torres, 2018). Albaidhani and Torres (2018) presented a conceptual framework that attempted to meld the innovation and project stages of innovation projects based on design thinking. Fehér and Varga (2019) examined the use of design thinking for developing customer-centric digital transformation in the banking industry. Their study exemplified the impact of changing customer expectations on pre-digital companies, such as reduced bank branch traffic since customers find visiting a bank branch annoying as they are accustomed to mobile applications and accessible ATMs (Fehér & Varga, 2019). Fehér and Varga (2019) suggested the use of design thinking to help understand and predict customer needs. In terms of specific techniques, two design thinking activities have been examined in innovation project settings.

The first of these design thinking techniques beneficial for innovation is storytelling. Storytelling is a common design thinking tool (Albaidhani & Torres, 2018). This practice

involves communicating narratives of a person or group's experiences and helps make sense of those experiences (Seergeva & Triflova, 2018). Storytelling plays a significant role in innovation by providing specific, engaging details about innovation and providing a mechanism for propagating innovation. (Sergeeva & Trifilova, 2018). Furthermore, storytelling was found to be helpful during the innovation process for motivating employees and defining the organization as innovative (Sergeeva & Trifilova, 2018). While this study only examined innovation in general, it does suggest that storytelling would be useful in the context of digital transformation.

The second of these design thinking techniques is scenario planning. The boundary-spanning activity of scenario planning has been used to guide organizational leaders to the practical applications needed for digital transformation (Lavikka et al., 2018). However, Lavikka et al. (2018) found that the use of such scenarios required facilitation by researchers to prompt the desired discussion, indicating some limitations to this approach. Additionally, Warner and Wäger (2019) noted that organizations are turning to big data to overcome the limits of scenario planning, indicating uncertainty about this technique's usefulness. Although some techniques may be uncertain, design thinking does provide the potential for informing digital transformation in projectized organizations.

Building information modeling. Another area of research that provides guidance for digital transformation in projectized organizations is the research around the implementation of Building Information Modeling (BIM). BIM provides digital 3D modeling for construction based on comprehensive digital data (Braun & Sydow, 2019). Such systems are designed so that all parties involved in the construction of a project, from architects to subcontractors, are able to

work off of the same comprehensive digital model (Braun & Sydow, 2019). BIM is considered a significant and valuable technology (Koseoglu et al., 2019).

BIM is purported to offer several benefits. The most notable benefits are related to the project management knowledge area of integration, since BIM is intended to increase interactivity, efficiency and information management (Didehvar et al., 2018). In theory, BIM brings several benefits including better information sharing, enhanced cooperation, and better information access (Matthews et al., 2017). Real-time monitoring is also a valuable contribution of BIM (Wang et al., 2019). Despite these celebrated potential benefits, research on the actual impact of BIM on project performance has been inconclusive (Kelly & Ilozor, 2019).

The advantages of BIM are lessened when it is not universal. BIM may be employed for just part of a construction project, limiting its centralization benefits (Kelly & Ilozor, 2019). Some geographic areas have high levels of BIM adoption across construction project participants. In the UK, BIM implementation is advanced while other regions such as Australia have less advanced adoption (Matthews et al., 2017). Additionally, while adoption of BIM in construction has been significant, adoption in infrastructure has lagged (Koseoglu et al., 2019). So, the process of BIM adoption cannot be championed as an exemplar of digital transformation. However, lessons learned from BIM adoption are valuable, including lessons regarding the barriers to digital transformation.

Barriers to Digital Transformation

Examination of the inconsistent state of digital transformation in projectized organizations suggests formidable challenges to such work. A review of the barriers to digital transformation from traditional and projectized organizations should inform future efforts towards digital transformation. The barriers analyzed are high cost, high risk, traditional

organizational culture, lack of skills, the challenges of data management, and lack of standardization. Projectized organizations seeking to adopt digital transformation will need to consider how to overcome these barriers.

Cost. The upfront cost of digital transformation is a barrier in some cases. New technology may require significant infrastructure updates (Altukhova et al., 2018). Such expenses could include technology license fees (Lobo & Whyte, 2017), storage and cloud computing (Sánchez & Zuntini, 2018), data gathering and analysis costs (Zaki, 2019) and more. So, while long-term cost savings may be promised, organizations may lack the funds to purchase pricey digital tools necessary to start working digitally (Kelly & Illozor, 2019; Koseoglu et al., 2019; Sánchez & Zuntini, 2018). Ultimately, the upfront costs may be generally worth it, but the value for a specific business may be uncertain. Thus, the barrier of cost is closely connected to the barrier of risk.

Risk. The risk from uncertainty and volatility around digital transformation is also a barrier. The uncertain and fast-moving digital business environment includes inherent risk (Lavikka et al., 2018; Martinsuo, 2019). Applicable innovation must be identified early to give organizations a competitive edge (Witschel et al., 2019). Organizational leaders do not know, which current digital innovation will best serve their organizations in the future and thus be a good use of resources now (Lavikka et al., 2018). Moving to digital may not pay off if done poorly or rejected by end users, so there is financial risk associated with digital transformation (Cavalieri & Saisse, 2019; Martinsuo, 2019). Additionally, timetable difference between major projects and their life expectancy and the development of technology is particularly challenging (Martinsuo, 2019; Whyte, 2019). Organizations must determine if incorporating current digital technology is worthwhile in buildings or infrastructure designed to last a century (Whyte, 2019).

It is difficult to determine if digital components popular now will be obsolete in twenty years. So, risks present a significant external barrier to digital transformation.

Organizational culture. Internally, organizational culture is a major barrier to digital transformation. The established culture of an organization has been specifically identified as a barrier for achieving the benefits of BIM (Kelly & Ilozor, 2019; Koseoglu et al., 2019). The required organizational change efforts needed to gain value from digital technology are significant but often glossed over (Love & Matthews, 2019). Hubbard and Rogers (2018) stated that organizations without a supportive culture will find innovation more challenging. Additionally, the case study conducted by Lewkowicz and Liron (2019) identified that a lack of attention to current routines when developing digital solutions reduced compliance with new digital processes.

Skills. Another barrier to digital transformation at an organization is lack of digital skills among employees. Sousa and Rocha (2019) surveyed 127 individuals via LinkedIn and found that all of the digital skill areas they identified (AI, nanotechnology, robotization, Internet of Things, augmented reality, and digitalization) were perceived to need moderate to significant development. Ifenthaler and Egloffstein (2020) found knowledge of basic components such as applications, but a lack of knowledge in complex components such as big data. From their survey of 32 employees in the architecture, engineering and construction industry, Didehvar et al. (2018) identified the necessity of technology expertise as the second most important challenge in the adoption of a digital innovation, following the necessity of reworking organizational processes. Koseoglu et al. (2019) also found that lack of resource skills and expertise impede an organization's ability to adopt digital innovation in projects. This barrier will also come to play

in situations where partners working together on a project have different levels of digital skills (Koseoglu et al., 2019).

Data management. Data-related issues also present a barrier to digital transformation. Significant data gathering has to occur before an organization is able to employ data analytics to gain meaningful insights (Ekambaram et al., 2018). In some cases, such as at the three major corporations studied by Whyte et al. (2016), sufficient volume of data was present, but structuring and controlling the data to ensure data integrity was challenging. This challenge led to the organization continuing to use traditional, rigid change management approaches rather than the flexible, real-time approaches said to be possible with big data (Whyte et al., 2016). Additionally, gaining meaningful insights from big data requires appropriate organizational interpretation and knowledge management, since individuals with different backgrounds may look at the data and come to different conclusions (Ekambaram et al., 2018). In other words, appropriate, thoughtful, and usually costly data analysis is needed for companies to leverage the benefits of that organization's data (Zaki, 2019).

Standardization. A final barrier to digital transformation is the lack of standardization. Geographical information systems (GIS), the cousin of BIM, which collects geographic data and offers visualization, does not meld well with BIM despite the value of using these two innovations in concert for building and infrastructure projects (Wang et al. 2019). Even two different BIM software applications presented integration issues (Braun & Sydow, 2019). A more common example is the lack of standardization between the two major mobile operating systems, iOS and Android, which increases the workload and time required to produce mobile apps (Senyo et al., 2019). Such lack of standardization increases the costs associated with digital

transformation, making benefits less attractive, and thus presenting a barrier to digital transformation.

Support Factors for Digital Transformation

Although the barriers to digital transformation are serious and daunting, factors that support successful digital transformation have also been identified from organizations that have worked toward digital transformation. These support factors are the implementation of digital transformation strategies, support from organizational leadership, and the use of digital hubs. Projectized organizations that have these organization-level components will have an easier time achieving successful digital transformation. Organizations without these supporting factors should consider developing them as the initial step in the journey to digital transformation.

Digital transformation strategies. A first supporting factor for digital transformation is a digital transformation strategy. Digital transformation strategies are intended to guide the transition from pre-digital to digital transformation (Chanias et al., 2019). Such strategies bridge technology strategy and business strategy (Chanias et al., 2019; Pramanik et al., 2019). Chanias et al. (2019) presented a model of digital transformation strategy development and argued that digital transformation strategy is ongoing and continuously progressing, arising out of digital strategy development interludes.

In practice, a number of companies lack digital transformation strategies altogether. Holgeid et al. (2018) examined digital strategy through a review of 31 relevant papers. In a majority of cases, organizations approached digital transformation in a variety of sporadic, unconnected ways without the use of a comprehensive digital strategy (Holgeid et al., 2018). They found a few areas where digital strategies gave companies a competitive advantage, however cases where a strategy was present were scarce (Holgeid et al. 2018).

The value of digital transformation strategies, when they are in place, was exemplified in case studies done by Sklyar et al. (2019) who compared two organizations that adopted digital servitization, a service-centric type of digital transformation. One of the organizations they studied had a plan but lacked a clear, broad vision to share, and this impeded the diffusion of digital servitization (Sklyar et al., 2019). The other organization Sklyar et al. (2019) studied did have a clear strategy that was based on the consensus of leaders and published in a white paper. This strategy supported digital servitization and allowed that organization to present itself as an industry leader in digital servitization (Sklyar et al., 2019). The value of digital transformation strategies also emerged in the literature review conducted Holgeid et al. (2018). Combining business strategy and IT strategy into a single digital transformation strategy should ensure effective use of resources and a return on investment for IT infrastructure costs (Holgeid et al., 2018). Strategy is not the only factor for successful digital transformation; other factors such as leadership support are key.

Organizational leadership support. Support from organizational leadership is a second support factor for digital transformation. In a longitudinal case study, Morgan (2019) identified the importance of leadership support in the adoption of BIM along with policies and procedures and training of employees. Leadership support enabled resource investments for experiments to enhance organizational capabilities (Morgan, 2019). Leadership support also legitimized the efforts (Morgan, 2019). Sánchez and Zuntini (2018) identified the leadership of the project owner as a capability supporting an organization's level of preparedness for digital transformation. A fully committed leader may even drive digital transformation, as Chanias et al. (2019) found in their case study. While organizational leadership support is needed, organization leaders will not have the capacity to directly carry out digital transformation work.

Digital hubs. Finally, digital hubs support the implementation of digital transformation. Guinan et al. (2019) found that many of the companies they studied determined that digital hubs were helpful for digital transformation. These hubs bridged functional areas and provided best practices, training, and knowledge collection (Guinan et al., 2019). Hinings et al. (2018) pointed to such hubs as a first step in the diffusion of digital transformation. Besides digital hubs and the other support factors identified, a recent area of pursuit in project management literature, benefits realization, offers insight for digital transformation from the perspective of creating and capturing benefits from digital transformation.

Benefits Realization and Digital Transformation

Benefits management is a relatively new area of pursuit (Terlizzi, Albertin, & de Moraes, 2017). According to PMI (PMI, 2018c), benefits realization management is the oversight and guidance of work that supports the capture and continuation of the benefits that do or could arise from projects, programs, and portfolios. Benefits realization or benefits management uses organizational project management structures, including the PMO and portfolio management, to reach beyond functioning within the triple constraint to creating business value (Aubry et al., 2007).

The focus of benefits management or benefits realization is the creation of value, the net result of benefits, considering the effort taken to achieve the benefits (Svejvig et al., 2019). The ultimate goal of digital transformation is value creation, so benefits realization scholarship, which examines how to create value through project-management-based processes, provides guidance that should inform worthwhile digital transformation through the PMO. Love and Matthews (2019) determined that many of the supposed benefits offered by BIM software have not been proven. They suggest taking a benefits management approach to the implementation of

digital technology to aid organizations in adopting only technology that brings value (Love & Matthews, 2019).

An understanding of value creation is a helpful starting point for a benefits management approach. While Romero et al. (2017) pointed to a monetary association with value, others state that value is based on desirability, which may or may not be monetary (Riis, Hellström, & Wikström, 2019; Svejvig et al., 2019). Value is connected to the project, portfolio, and organizational level (Martinsuo, 2019). Stakeholders may have different perceptions of the value of a particular project or result (Svejvig et al., 2019). Additionally, value creation is challenging work. Less than 10 percent of organizations surveyed by PMI indicated high value delivery maturity (PMI, 2018c).

Benefits management work starts by examining the desired result, or value, and then involves figuring out how to obtain that desired result (Musawir et al., 2017). Several similar models outline this process. The five-step Cranfield Process Model provides a framework for benefits management from the IT sector (Romero et al., 2017; Terlizzi et al., 2017). This model includes the steps of identification, planning, executing, analyzing, and determining future benefits (Romero et al., 2017). PMI's model of benefits realization includes three components: identification of benefits, execution of benefits realization through projects, and sustainment of the realized benefits (PMI, 2018c). Riis et al. (2019) presented three steps for value creation: identification of value, creation of value, and harvesting of value. The similar paths of each of these models provide a clear roadmap for benefits realization.

Scholarly literature and PMI have provided suggestions of specific tools for use in executing these models. In the case study they examined, Romero et al. (2017) found that an organization incorporated benefits realization into the creation of project business cases and

project specifications. This was combined with the identification of five milestones where benefit plans are compared to the organization's goals and objectives, and periodic benefits progress reports (Romero et al., 2017). Gomes and Romão (2018) suggested benefits management, including benefit mapping, as a way for organizations to build the dynamic capabilities necessary for remaining competitive, a strategy that was effective in the case study they examined. Einhorn, Marnewick, and Meredith (2019) emphasized the importance of incorporating and employing the business case throughout business technology projects and found that projects not using the business case for execution and benefits management suffered. According to PMI, key tools for benefits realization management are the benefits realization management plan, benefit profiles, a benefits register, a benefits map, and a benefits traceability matrix (PMI, 2018c). Benefits realization management plans, like other project management plans, present a specific path for achieving the project's benefits; benefit profiles are explanations of the proposed benefit and how to determine if it is achieved; benefits registers collect benefit profiles and facilitate tracking; a benefits map is a visualization of the process for realizing a specific benefit; and a benefits traceability matrix is a matrix that plots the benefit in relation to project, program, or portfolio outputs (PMI, 2018b).

One area of benefits realization that has been a challenge is accountability and ownership of this work. The case study completed by Romero et al. (2017) indicated that identification of responsibility for benefits realization was lacking. Similarly, Zwikael, Meredith, and Smyrk (2019) interviewed 13 senior leaders at a projectized organization and discovered that ownership of project benefits becomes murky once the project reaches execution because the project manager does not have sufficient power for it to be appropriate to hold them accountable for

benefits realization. Thus, Zwikael et al. (2019) suggested a senior-level operational manager involved in project governance as the appropriate accountable individual.

Although ownership is not clearly defined, benefits realization is connected to project governance (PMI, 2018c). PMI (2018c) defined roles and responsibilities for benefits realization management with significant components assigned to an organizations' governance. Governance mechanisms, including the PMO, were shown to provide links between the organization and projects to ensure value generation in four case studies (Riis et al., 2019). The recognition of the PMO's role in value generation and other insights from this review of benefits realization provides affirmation that project management structures are able to aid in the realization of digital value through digital transformation. Since the goal of this study is to enable PMOs to implement digital transformation, a thorough review of PMOs is in order.

Project Management Offices

The work and domain of the project management office. What constitutes a PMO and how PMOs function has been studied by several scholars, but little consensus has been achieved (Aubry & Brunet, 2016; Aubry et al., 2007; Braun, 2018; Bredillet et al., 2018a; Darling & Whitty, 2016). In their seminal conceptualization of the PMO Aubry et al. (2007) presented a model of the PMO as a boundary-spanning and linking part of organizational project management. Artto et al. (2011) pointed to PMOs as an integrative control system. Defining elements of PMOs are boundary-spanning work (Artto et al., 2011; Aubry, 2015), a multi-project reach (Aubry & Brunet, 2016) and coordination efforts (Braun, 2018; Bredillet et al., 2018a). These elements support the broad goal of improving project management at the organization (Lacruz et al. 2019; Monteiro, Santos, & Varajão, 2016). PMI has been more specific and presented PMOs as organizational units responsible for establishing uniform project governance,

allocating resources, and providing project management processes (PMI, 2017). This activities-focused definition reflects common tasks identified by scholars, but it fails to convey the breadth of what PMOs have been found to do in practice.

The activities of PMOs have varied widely. Aubry and Brunet (2016) found that collaboration and communication work was the most common work done by PMOs, above controlling and monitoring. In one case study, the PMO was observed to be charged with knowledge management, tracking, reporting, portfolio management, supporting project managers on various topic areas, training project staff, providing templates and systems, addressing at risk projects, and more (van der Linde & Styne, 2016). Szalay, Kovács, and Sebestyén (2017) listed common PMO services including management of portfolios, governance of projects, selection of project management methods, optimization of resources, and managing tools for project management. Sandhu et al. (2019) found that PMO activities included connecting projects with the organization's goals and objectives, supporting project management capabilities, enhancing learning, communicating across the organization, project selection, and emphasizing the organization's identity. PMOs have even been founded for the purpose of directing specific organizational change efforts (Lavoie-Tremblay et al., 2017). Furthermore, Riis et al. (2019) determined that PMOs in practice do work beyond what is found in literature on PMOs. Darling and Whitty (2016) argued that coming up with a defined list of PMO tasks is futile since PMOs have attempted to tackle all sorts of project-related and operations-related tasks. Among the many activities identified, two significant threads emerged: PMOs as best practice centers and the PMO's contribution to knowledge management.

The activity of identifying and establishing best practices is frequently mentioned in PMO literature (Darling & Whitty, 2016; Lacruz et al., 2019; Lavoie-Tremblay, Aubry, Richer,

& Guylaine, 2018; Monteiro et al., 2016; Szalay et al., 2017). This responsibility highlights the influence and impact of PMOs. In their survey of various project management professionals, Sandhu et al. (2019) found that PMOs have become centralized sources of project management resources. PMOs make an organization's project management more centralized and apparent (Aubry & Hobbs, 2011). Additionally, PMOs have the external connections necessary to benchmark an organization's project management practices (Aubry & Hobbs, 2011). In other words, PMOs control and set the standards for how project management is done at the organization. This work was exemplified in a case studied by Bredillet et al. (2018a) when PMO employees identified a best practice that some project managers were doing and shared that application across the organization. One of the best practices the PMO can propagate is the appropriate management of digital innovation (Hubbard & Rogers, 2018). Although Darling and Whitty (2016) questioned the applicability of best practices, they did acknowledge that being charged with implementing best practices gives the PMO significant power to impact the organization.

Another commonly recognized activity that shows the potential of the PMO is its work in knowledge transfer among projects (Lacruz et al., 2019; Riis et al., 2019; Szalay et al., 2017). PMOs both collect knowledge from multiple projects and apply that knowledge in the organization's project management processes (Tshuma et al., 2018). Unlike temporary projects, PMOs have the longevity that allows for the collection of knowledge from projects and sharing of that knowledge in future projects, with the goal of improving performance or avoiding issues (Lacruz et al., 2019). The PMO makes sense as the owner of a unified lessons learned database (Riis et al., 2019; Sandhu et al., 2019). Overall, PMOs move knowledge across organizational boundaries (Szalay et al., 2017). This recognized and common work of knowledge management

point to the appropriateness of the PMO as a starting point for diffusing new knowledge in a projectized organization.

Types of project management offices. The diversity in PMO tasks continues when PMO typology or roles are considered. Hobbs and Aubry (2008) used descriptions of 500 PMOs to identify three broad types: (1) the PMO with many projects and project managers that has significant authority for decision making, (2) the PMO with minimal projects or managers and little authority for decision making, and (3) the PMO charged with most or all of the organization's projects with minimal project managers and some authority for decision making. Artto et al. (2011) categorized PMOs based on work: (1) practice management, (2) administrative support, (3) oversight of projects, (4) consultation or training, and (5) project selection and evaluation. According to Aubry and Brunet (2016), there are many types of PMOs and no unified system of types. They presented a categorization of PMOs based on the sort of projects within their purview and identified differences between PMOs that worked with business projects compared to those that worked with construction projects (Aubry & Brunet, 2016). This was in contrast to earlier findings by Hobbs and Aubry (2008) of no noticeable difference between PMOs based on industry. The variety of PMOs is as large as the variety of organizations where PMOs operate (van der Linde & Steyn, 2016). While understanding potential types of PMOs highlights the breadth of work done by PMOs, Bredillet et al. (2018a) questioned the value of research into PMO types, and instead suggested focusing on PMO change. A similar question arises out examinations of PMO role, which also showcase great variety (Monteiro et al., 2016).

Project management office role. PMO role definition has remained challenging because of the many variations observed in PMOs (Aubry et al., 2007; Kaul & Joslin, 2019;

Sandhu et al., 2019). One approach to PMO roles is to delineate based on support or control (Aubry, 2015; PMI, 2017). Aubry (2015) made the distinction between the supporting role of the PMO and the controlling role, with supporting PMOs offering coaching and learning in contrast to controlling PMOs that were responsible for monitoring projects and providing a system of control. Aubry (2015) found that increased use of the supporting role improved project performance while increased use of the controlling role did not. This distinction between supporting and controlling is also reflected in PMI's conceptualization of PMOs. PMI (2017) presented three distinct roles for PMOs: supporting, controlling, and directing. Supportive PMOs serve as a resource, providing tools to projects; controlling PMOs mandate compliance with certain methods or systems; and directive PMOs manage project managers and by extension projects (PMI, 2017). The findings by Aubry (2015) of better project performance when the PMO takes on a supportive role leads to the conclusion that supportive PMOs would be more useful for digital transformation work based on this delineation of PMO roles.

An alternative approach to understanding PMO roles is to differentiate between strategic and tactical PMOs (Bredillet et al., 2018a; Müller et al., 2019; Sandhu et al., 2019). A difference between strategic and tactical functions was found by Sandhu et al. (2019), however they ultimately argued that PMOs are customized based on the organizations where they exist. Other scholars have also differentiated between a strategic PMO aimed at organizational matters and a tactical PMO aimed at supporting project delivery (Bredillet et al., 2018a; Müller et al., 2019). In this framework, strategic PMOs would be more appropriate for the work of digital transformation because strategic PMOs have an organizational focus (Müller et al., 2019).

Overall, perspectives on PMO role have evolved from a project-only focus to a higher-level strategic focus (Braun, 2018). Artto et al. (2011) noted that earlier studies of PMOs had

centered around the project-related work done by these entities. They presented an exploratory study of PMOs as organizational integrators, specifically at the beginning of innovation projects (Arto et al., 2011). They found that organizational structures similar to the PMO were involved in the up-front integration of innovation projects (Artto et al., 2011). Tshuma et al. (2018) also emphasized the integrative role of PMOs between projects. Likewise, Sandhu et al. (2019) pointed to an organizational connection when they noted that PMOs are key for bridging organizational ecosystems and specific projects. The PMO role is now seen as variable and evolutionary, centered around the needs of the parent organization (Lacruz et al., 2019; van der Linde & Steyn, 2016).

Project management office development. Scholars have observed significant change and evolution in PMOs (Bredillet, Tywoniak, & Tootoonchy, 2018b; Kaul & Joslin, 2019; Kutsch, Ward, Hall & Algar, 2015). The rise of PMOs reflects the rise of work done via projects (Aubry et al., 2007). Early PMOs focused significantly on project success as defined by the triple constraint (Darling & Whitty, 2016). Artto et al. (2011) examined a shift in focus from the use of PMOs to control project execution to the use of PMOs for innovation. In their review spanning 20 years of PMO literature, Kaul and Joslin (2019) found a transition from practical, narrow views of the PMO to broader organizational views of the PMO. Using PMOs for major strategic initiatives has been a subject of recent scholarship (Lavoie-Tremblay et al., 2017; Lavoie-Tremblay et al., 2018; Riis et al., 2019; Sandhu et al., 2019). In addition to this long-term evolution of PMOs, individual PMOs also change frequently (Bredillet et al., 2018a).

Whether these changes represent a meaningful evolution or a survival mechanism has been examined. Some point to organizational environment as the key motivator of PMO change. Pellegrinelli and Garagna (2009) argued that PMOs are both subject to change and instigators of

change. The perceived value of PMOs is cyclical, ranging from of high value when initiating new project management innovations or best practices to low value when those innovations or best practices are institutionalized and the PMO appears less necessary. (Pellegrinelli & Garagna, 2009). Bredillet et al. (2018a) presented their conceptualization of PMOs and project portfolio management development, then studied six case studies (Bredillet et al., 2018b) and determined that PMOs and project portfolio management change in a symbiotic matter in response to the organization's context. Additionally, Darling and Whitty (2016) highlighted the perspective that PMOs change in response to the needs of their organization while also pointing to the PMO staff's desire for self-preservation as a driver of PMO evolution. In other words, because of the great variety of roles and tasks done by PMOs make them hard to measure, the best justification and preservation mechanism for PMOs is their responsiveness to business needs (Darling & Whitty, 2016). Since a current business need for projectized organizations is digital transformation, it is reasonable to consider the application of PMOs for such work, particularly because there is precedent for using PMOs in organizational change.

Project management office participation in organizational change. Projects are commonly used as vehicles for innovation projects (Albaidhani & Torres, 2018; Bredillet et al., 2018a; Hubbard & Rogers, 2018), but are not appropriate for the ongoing and organizationally embedded work of digital transformation. PMOs have been suggested as helpful for managing complexity and providing structure to health care transformation initiatives (Lavoie-Tremblay et al., 2017). Furthermore, Lavoie-Tremblay et al. (2017) pointed out that organizational changes have far-reaching influences, such as on human resources, that need to be controlled beyond the scope of a single project. In other words, digital transformation work is at the ecosystem level (Hubbard & Rogers, 2018) and thus requires an ecosystem-level vehicle. Hubbard and Rogers

(2018) specifically claimed that PMOs are a necessary component of the innovation ecosystem of an organization because of their impact on said ecosystem. A project alone would not offer such control and centralization.

Besides being more appropriate for digital transformation of a projectized organization than projects, PMOs also bring benefits in the areas of building dynamic capabilities and strategy implementation. Lacruz et al. (2019) determined that PMOs could serve as a catalyst for developing dynamic capabilities and overall support long-term viability. PMI (2018a) said that enterprise project management offices (EPMOs) regardless of name, are able to and do work on strategic projects in conjunction with organizational leadership, although examples were not given. Sandhu et al. (2019) also identified a clear relationship between the activities of the PMO and work in support of an organization's strategy. Given the ubiquity of digital technology and interest in digital transformation, it seems likely that most organizations would incorporate some component of digital transformation into their organizational strategy, if that has not occurred already. According to Bredillet et al. (2018b), because PMOs support successful project portfolio management, and project portfolio management is how organizations implement their strategic objectives, PMOs play a key role in bringing strategy into practice. This relationship between PMOs and strategy implementation in projectized organizations is also represented in the lens of organizational project management (OPM).

The project management office and organizational project management. The concept of OPM was initially centered around the integration of project, program and portfolio management (Müller et al., 2019). Now, organizational project management is the extension beyond single projects to the environment, which supports and enables the best projects (Aubry, Sicotte, Drouin, Vidot-Delerue, & Besner, 2012). Organizational project management covers the

influence and impact of project management in an organization (Aubry et al., 2012). The goal of OPM is to create value by improving project management (PMI, 2013). The domain of OPM includes topics such as benefits realization, strategic management, and project management methodologies (Müller et al., 2019). PMI (2018b) determined that OPM methodology, knowledge management, talent management, and OPM governance were the key components of OPM. Ultimately the reach of OPM is wide. Müller et al. (2019) presented a seven-layer model of OPM that included the diverse array of OPM components, ranging from project management at the center to organizational philosophy at the perimeter. This model illustrated the vast scope of OPM and how this area of project management scholarship covers the connections between project management and the organization. A key component of OPM is improving project management by comparison with best practice standards, such as those presented in PMI's Organizational Project Management Maturity Model (Graf & Seelhofer, 2018).

Improvement of OPM is achieved through functions offered by the PMO (Müller et al., 2019; PMI, 2013). These services can encompass training and coaching; coordinating communication between projects and programs; creating and implementing policies, procedures, and templates; determining and improving project management methods and practices; ensuring compliance with approved methods and practices; and integrating project participants into OPM improvement (PMI, 2013; PMI, 2018b). As this list of OPM functions illustrates, strategic PMOs determine what project management looks like at an organization (Müller et al., 2019). For projectized organizations adopting digital transformation, this PMO charge is significant.

Ultimately, digital transformation supports organizational project management maturity because of the alignment of the desired results of both efforts. Organizational project management maturity at its highest level involves ongoing organizational development, close

connections between project management and organizational strategy, and availability of tools that aid in value generation, organizational agility, and innovation in the organization (PMI, 2018b). These desired results closely reflect the desired results of digital transformation, namely ongoing improvement (Warner & Wäger, 2019), generation of value from digital technology (Chanias et al., 2019), the presence of dynamic capabilities that facilitate agility (Lobo & Whyte, 2017; Warner & Wäger, 2019) and the creation of new digital innovation (Hinings et al., 2018). Additionally, Hubbard and Rogers (2018) noted a connection between an organization's OPM abilities and the organization's ability to manage innovation. Furthermore, PMOs define project management at an organization (Müller et al., 2019), and for projectized organizations, project management is the main organizational function (Gemünden et al., 2018). Thus, a projectized organization that desires digital transformation will need to use the PMO in the adoption of digital transformation to ensure digital transformation of project management and thus achievement of digital transformation by the organization.

Summary

This review of scholarly work on digital transformation, barriers and success factors, benefits realization, and PMOs uncovered a breadth of relevant insights. According to these studies, little of the ongoing, uniquely challenging, organization-wide work of digital transformation has occurred in pre-digital projectized organizations. Studies of other organizations' experiences presented barriers that must be overcome related to digital transformation and support factors that facilitate digital transformation. In the area of project management, scholarship on benefits realization practices provide relevant guidance regarding value creation, which could be applied to digital transformation. Finally, literature on the PMO

showcased the qualities of this organizational function that could be relevant to and valuable for the work of digital transformation.

The phrase "digital transformation" was defined as the new use of digital technology as well as the corresponding reconfiguration of organizational systems and processes (Chanias et al., 2019; Sklyar et al., 2019). Tekic and Koroteev (2019) postulated that the level of digital transformation appropriate for an organization and a digital transformation strategy should vary based on organizational readiness and technology proficiency. Dynamic capabilities support digital transformation work (Warner & Wäger, 2019), work that is motivated by customer expectations (Bauer et al., 2018), and the risk of losing competitive advantage (Pramanik et al., 2019).

The studies in this review indicated that the value of digital transformation is presumed in projectized organizations (Didehvar et al., 2018; Hubbard & Rogers, 2018; Morgan, 2019; Wang et al., 2019), but implementation is lacking (Ekambaram et al., 2018; Auth et al., 2019; Guinan et al., 2019). Also, there are not defined systems or frameworks for guiding digital transformation in projectized organizations Cavalieri & Saisse, 2019).

This review uncovered five major barriers to digital transformation and three key support factors. While digital tools may offer long-term value, companies have recognized that startup costs present a significant barrier (Kelly & Illozor, 2019; Koseoglu et al., 2019; Sánchez & Zuntini, 2018). The fast and uncertain digital environment makes missteps in digital transformation costly, making such work risky (Lavikka et al., 2018). Organizational culture has the ability to inhibit digital transformation efforts (Lewkowicz & Liron, 2019). Lack of workers with digital skills is an issue for digital transformation (Koseoglu et al., 2019), as is data management (Ekambaram et al., 2018). Finally, a lack of standardization across digital tools

increases workload (Senyo et al., 2019). Regarding support factors, a digital transformation strategy provides a competitive advantage (Holgeid et al., 2018). Organizational leadership support also aids digital transformation through resource commitment and legitimizing the work (Morgan, 2019). Lastly, digital hubs are considered helpful for digital transformation (Guinan et al., 2019).

Benefits realization scholarship in project management has focused on tools and methodology for ensuring value creation (Svejvig et al., 2019). Use of a business case (Einhorn et al., 2019) and the development of benefit profiles, benefits registers and benefits maps (PMI, 2018c) emerged as key tools. However, benefits management literature indicates that ownership of benefits management is not well established (Romero et al., 2017), though PMOs are expected to be involved (PMI, 2018c).

The complex and dynamic nature of PMOs was discussed in multiple studies. The tasks of PMOs have included communication, monitoring, reporting, portfolio management, training, providing templates, selection of project management methods and more (Aubry & Brunet, 2016; Riis et al., 2019; Szalay et al., 2017; van der Linde & Styne, 2016). Research into PMO typology and role has yielded little meaningful consensus according to Bredillet et al. (2018a). The well-recognized trend of PMO change showed that PMO purposes change (Bredillet et al., 2018b; Kaul & Joslin, 2019; Kutsch et al., 2015). PMOs evolve in response to business environment and organizational needs (Bredillet et al., 2018b; Darling & Whitty, 2016). The connections between PMOs and digital transformation were also found in scholarship showing the PMO's ability to build dynamic capabilities (Lacruz et al., 2019). How specifically PMOs should go about the work of digital transformation will be addressed in Chapter 3.

Solution

In Chapters 1 and 2, the digital business environment and its influence on projectized organizations was examined. Digital innovations will impact how organizations do projects and the ability of those organizations to meet customer expectations for value via digital solutions and superior outcomes (PMI, 2018a; Whyte, 2019; Whyte et al., 2016). The review of scholarly work on digital transformation and projectized organizations revealed the value and necessity of digital transformation (Didehvar et al., 2018; Hubbard & Rogers, 2018; Morgan, 2019; Wang et al., 2019). However, the presence of digital transformation, documented in the published research, was limited, as evidenced by minimal project management tools in the significant digital transformation area of robotics and AI (Auth et al., 2019; Martinsuo, 2019), rarity of digital teams (Guinan et al., 2019), and continued use of traditional processes (Lavikka et al., 2018). Overall, widespread use of digital tools and transitions to digital ways of working were not identified.

An organization's ability to take on significant change, such as digital transformation, is a result of its dynamic capabilities (Braun & Sydow, 2019; Lacruz et al., 2019; Teece, 2007). Dynamic capabilities fall within the categories of sensing, seizing, and reconfiguration (Mousavi et al., 2018). Sensing refers to the ability to identify opportunities the organization can leverage, while seizing refers to responding and taking those opportunities. Reconfiguration is refashioning the organization based on its environment (Mousavi et al., 2018). Dynamic capabilities aligned with these categories are helpful and necessary for digital transformation (Braun & Sydow, 2019; Warner & Wäger, 2019). The next logical question for projectized organizations is how to build dynamic capabilities, and who is responsible for such work.

In projectized organizations, the PMO holds a cross-department function, determining project management best practices, and providing integrated control (Aubry et al., 2007; Artto et al., 2011; Darling & Whitty, 2016). PMOs are intended to enhance project management at an organization (Lacruz et al., 2019; Monteiro et al., 2016). Activities of PMOs have evolved based on the needs of the organizations where they exist (Sandhu et al., 2019). Based on this function and evolution, PMOs have significant potential to build dynamic capabilities for digital transformation in projectized organizations. However, there is no model for digital transformation through the PMO (Cavalieri & Saisse, 2019).

Because of this gap, the model presented provides needed direction for projectized organizations to meet the challenge of digital transformation and represents a new offering to scholarship on PMOs and digital transformation. In this model, the projectized organization, facing the pressure of the digital business environment, leverage the common structure of the PMO (PMI, 2018a). The PMO will assess the organization's readiness and technology proficiency to determine organizational type (Tekic & Koroteev, 2019). Based on this type, a PMO action path is recommended to develop dynamic capabilities for digital transformation. This model of paths to digital transformation via the PMO is a novel synthesis of the literature on digital transformation and PMOs. It also contributes to the ongoing study of PMO evolution in response to organizational needs by illustrating the ability of PMOs to address digital transformation (Sanhu et al., 2019; van der Linde & Steyn, 2016). Furthermore, this solution is applicable to any projectized organization with a PMO, enabling use across various industries.

Overview of the Solution

Because of the need for digital transformation and the lack of guidance about how to achieve it, a model for the PMO as a hub for digital transformation of a projectized

organization's project management has been developed. Digital hubs have been recognized as a support factor for digital transformation because hubs work across functional areas and can centralize best practices, digital knowledge, and training (Guinan et al., 2019; Hinings et al., 2018). This digital hub role reflects the PMO role of bridging departments at projectized organizations (Sandhu et al., 2019; Tshuma et al., 2018), propagating best practices (Darling & Whitty, 2016; Lacruz et al., 2019; Lavoie-Tremblay et al., 2018; Monteiro et al., 2016; Szalay et al., 2017), and centralizing resources (Sandhu et al., 2019). Given this strong similarity, leveraging the PMO for digital transformation is a sensible and cost-conscious method for projectized organizations to address digital transformation.

In addition to role alignment, the proposed actions for embedding digital transformation into organizational culture are appropriate for the PMO because of the close alignment with the type of work a strategic PMO is already doing (Sandhu et al., 2019). In this model, the PMO is charged with key actions of building digital skills, increasing design thinking, or enhancing benefits realization, with the goal of creating a supportive organizational culture, a significant support factor for digital transformation (Kelly & Illozor, 2019; Koseoglu et al., 2019). Building digital skills is valuable for increasing organizational support for digital transformation (Koseoglu et al., 2019). Organizations with digitally skilled employees will be able to jump on digital initiatives without being delayed by needing to train or hire staff. Increasing the use of design thinking will embed digital transformation in organizational culture by making digital and innovative exploration a normal part of the project management process. Similarly, enhancing benefits realization, which involves incorporating benefits realization practices into project management and increasing emphasis on value (PMI, 2018c), will embed digital transformation into organizational culture by including digital value considerations into normal processes.

The application of this model begins with two major steps: assessing organizational characteristics and assigning a distinct path to dynamic capabilities and digital transformation based on that assessment. These distinct process paths are based on the organization's level of technology proficiency and organizational readiness for digital transformation, as suggested by Tekic and Koroteev (2019). Each of these paths connects to PMO actions in the areas of training or project management methodology, areas that fall within the PMO role (Aubry & Hobbs, 2011; Darling & Whitty, 2016; Sandhu et al., 2019). The paths then lead to general outcomes suggested by Tekic and Koroteev (2019), and ultimately the dynamic capabilities. Thus, PMOs at projectized organizations will be able to use these paths to develop dynamic capabilities, which support digital transformation (Warner & Wäger, 2019).

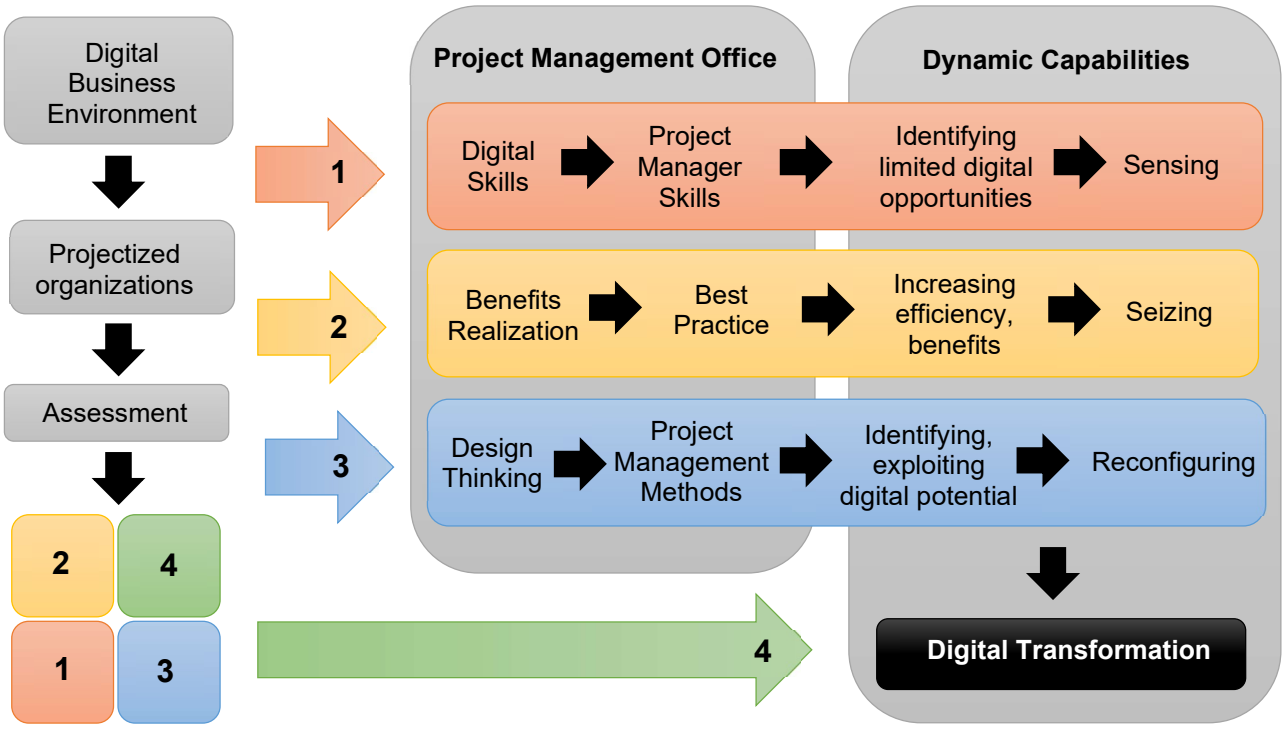

Figure 1. Digital Transformation Implementation Model. A model for implementing digital transformation in projectized organizations through the PMO.

The model in Figure 1 begins with an assessment of the projectized organization based on technology proficiency and organizational readiness for digital transformation (Tekic & Koroteev, 2019). This matrix-based assessment results in the categorization of organizations as Type 1 (low technology proficiency and low organizational readiness), Type 2 (high technology proficiency and low organizational readiness), Type 3 (low technology proficiency and high organizational readiness), or Type 4 (high technology proficiency and high organizational readiness). Based on this classification, the PMO is charged with conducting actions related to project manager training, project management methodology use, or establishing project management best practices.

The PMOs at Type 1 organizations should develop digital skills of project managers and staff with the goal of adopting digital innovation in selected areas (Koseoglu et al., 2019; Orji, 2019). PMOs at Type 2 organizations should incorporate effective benefits realization, particularly as it relates to digital benefits, into project management best practices for the organization. Use of benefits realization will enable Type 2 organizations to leverage value from their high technology proficiency (Svejvig et al., 2019). PMOs at Type 3 organizations should incorporate design thinking tools and techniques into the organization's project management methodology, since design thinking is useful for understanding how to apply innovation (Albaidhani & Torres, 2018; Fehér & Varga, 2019). The Type 4 classification applies to highly flexible organizations able to engage in disruptive practices, typically startups (Tekic & Koroteev, 2019), outside the scope of this model. It is expected that many projectized organizations are Types 1-3 and that such organizations would gain value from this solution.

Overall, this solution provides practical guidance for PMOs on how to facilitate the adoption of digital transformation in projectized organizations. This solution will remain

valuable and relevant as new digital technology continues to pervade the business environment (Warner & Wäger, 2019) and lead to rapid change (Orji, 2019; Sousa & Rocha, 2019). Additionally, adopting digital transformation, as outlined in this solution, goes hand-in-hand with strengthening organizational project management, given the close alignment between organizational project management maturity and digital transformation (Chanias et al., 2019; Hinings et al., 2018; Hubbard & Rogers, 2018; Lobo & Whyte, 2017; PMI, 2018b; Warner & Wäger, 2019). A closer examination of this solution illuminates the scholarly support for this solution and its value.

Description of the Solution

The premise of this solution is that PMOs are able to develop organizational dynamic capabilities (Lacruz et al., 2019) and that PMOs are best suited for developing dynamic capabilities for digital transformation in the specific context of projectized organizations. The PMO is a common organizational structure in projectized organization (PMI 2018a), so employing this structure pre-existing structure reduces the challenge of cost (Kelly & Illozor, 2019; Koseoglu et al., 2019; Sánchez & Zuntini, 2018) associated with digital transformation. Additionally, PMOs have the cross-functional connections (Sandhu et al., 2019) necessary to prompt and reinforce the organizational culture support, which is key for digital transformation (Kelly & Ilozor, 2019). Furthermore, the proposed actions align closely with the scope of PMO work related to training and skill development (van der Linde & Styne, 2016), determining the nature of project management at an organization (PMI, 2017), and establishing best practices (Darling & Whitty, 2016). Finally, the PMO has the longevity that digital transformation project would lack (Lacruz et al., 2019), which enables continued responsiveness to digital trends and evolving technology (Orji, 2019; Sousa & Rocha, 2019; Whyte, 2019). A closer look at the

process outlined in Figure 1 reinforces the appropriateness and necessity of using the PMO to implement digital transformation in projectized organizations.

As presented in Figure 1, pursuit of this solution is prompted by the digital business environment and the influence of this environment on projectized organizations. The digital business environment is the current context of business resulting from ever-improving digital technology and widespread internet access, where higher quality products and digital solutions are expected (Koseoglu et al., 2019; Sousa & Rocha, 2019). The digital business environment includes blurred industry lines and increased competition from new entrants to the market (Lavikka et al., 2018; Martinsuo, 2019). Established companies are being challenged by innovative disruptors with the digital proficiency to outperform established organizations who lack such proficiency (Hubbard & Rogers, 2018). This environment creates pressure on organizations to keep up and remain competitive (Sousa & Rocha, 2019). Projectized businesses facing the pressures of the digital business environment and looking to increase digital transformation should look to the PMO. Appealing to the PMO for assistance in this situation is consistent with the way PMOs have been reoriented around the problems of their parent organizations (Lacruz et al., 2019; van der Linde & Styne, 2016). The PMO charged with digital transformation work should begin with the first step presented in the model, assessment.

This assessment identifies the pressing digital transformation issue for individual organizations and accounts for the limited digital transformation in projectized organizations such as the use of BIM (Koseoglu et al., 2019) and digital delivery (Whyte, 2019). The assessment to determine the appropriate strategy for a projectized organization aligns with the matrix for digital transformation strategies offered by Tekic and Koroteev (2019). The 2 x 2 matrix is used to classify four types of organizations based on low or high technology

proficiency and low or high organizational readiness for digital transformation (Tekic & Koroteev, 2019). From the assessment in this model, four types of organizations emerge; each of these require a different strategy and related PMO actions (Tekic & Koroteev, 2019).

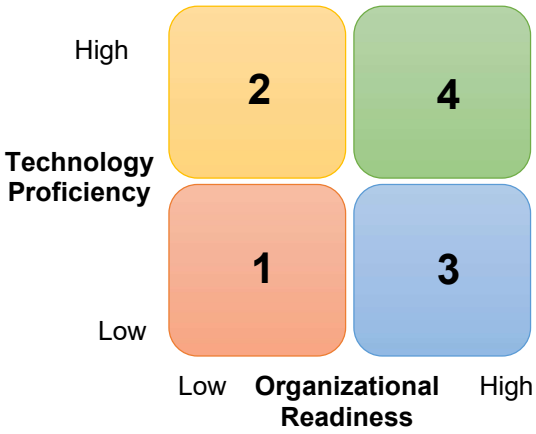

Figure 2. Digital Transformation Assessment Matrix. An assessment matrix for categorizing organizations or parts of organizations based on technology proficiency and organizational readiness for digital transformation.

Type 1 organizations are characterized by low technology use and low organizational preparedness (Tekic & Koroteev, 2019). Such organizations are likely to be ones who produce products or services that have no need to be digital (Tekic & Koroteev, 2019). In other words, digital technology offers potential bonuses, but is not vital for these organizations to stay competitive. The strategy for PMOs at organizations in this situation is to enable the organization's project managers find small, situation-appropriate wins (Tekic & Koroteev, 2019) and thus develop the dynamic capability of sensing.

The specific PMO action appropriate in this situation is providing training in digital skills for project managers and project team members. Equipping these individuals with digital skills removes a significant barrier to digital transformation (Koseoglu et al., 2019). Digital skills are the most significant step towards digital transformation outside of changing organizational

structures (Didehvar et al., 2018) and need to be present to reach digital transformation (Orji, 2019). Digital skills support the dynamic capability of sensing, that is recognizing opportunities (Mousavi et al., 2018). Thus, by building digital skills, PMOs at Type 1 organizations can aid in moving those organizations into the Type 2 category where knowledge of digital tools is leveraged to gain benefits (Tekic & Koroteev, 2019). The work in this path is appropriate for PMOs because of the recognized PMO role of training and supporting project managers (van der Linde & Styne, 2016).

Type 2 organizations are characterized by high technology proficiency and low organizational preparedness (Tekic & Koroteev, 2019). These organizations are likely to be skilled in using the types of technology common in their industry, able to see the benefits of technology, but not willing or able to change the structure of how business is done (Tekic & Koroteev, 2019). The strategy for PMOs at organizations with this classification is to enable projects to achieve greater efficiency and gain benefits from technology (Tekic & Koroteev, 2019). This path reflects the suggestion of Love and Matthews (2019) who advised the use of a benefits management approach to assure organizations only adopt technology that brings value.

The specific PMO action necessary in this situation is to incorporate benefits realization into the best practices of project management in that organization. Benefits realization is the management of project work related to ensuring that projects generate value (PMI, 2018c). Including expectations of digital business benefits should enable these organizations to leverage value from their higher technology proficiency, thus achieving value from digital technology as is the goal of digital transformation (Sousa & Rocha, 2019). Increased use of benefits realization supports the dynamic capability of seizing, which is reacting to opportunities that arise (Mousavi

et al., 2018). Encouraging benefits realization practices is appropriate for the PMO because such work aligns with PMO work in determining best practices (Sandhu et al., 2019).

Type 3 organizations are characterized by low technology proficiency and high organizational preparedness (Tekic & Koroteev, 2019). These organizations are likely to be experiencing significant competition and pressure to evolve (Tekic & Koroteev, 2019). Digital transformation is a necessity because of this competition. The strategy for PMOs at organizations in this situation is to enable the identification and exploitation of digital opportunities through appropriate project management methodologies (Tekic & Koroteev, 2019) and thus develop the dynamic capability of reconfiguration.

The specific PMO action appropriate in this situation is incorporating design thinking techniques into the project management methodology used at the organization. Design thinking was introduced to the project management field as a way to navigate complex and uncertain projects (Mahmoud-Jouini et al., 2016). It is valuable for building digital transformation, innovation, and facilitating boundary-spanning ideation (Albaidhani & Torres, 2018; Fehér & Varga, 2019; Seergeva & Triflova, 2018). In other words, use of design thinking should aid projectized organizations in finding ways to incorporate digital innovation in projects. Thus, design thinking supports the dynamic capability of reconfiguring, that is aligning the organization with opportunities that emerge (Mousavi et al., 2018). The work of incorporating design thinking in an organization's project management methodology aligns with PMO responsibility for selecting project management methods (Szalay, Kovács, & Sebestyén, 2017). Also, this type of action is relevant for PMOs because of its responsibility for developing project management systems and tools (van der Linde & Styne, 2016; Szalay et al., 2017).

Type 4 organizations are characterized by high technology proficiency and high organizational preparedness. The strategy for these organizations is to adjust their business model as necessary to lead disruptive innovation (Tekic & Koroteev, 2019). Organizational flexibility and disruptive behavior extend beyond the parameters of the PMO's influence in organizational project management (Müller et al., 2019) and is thus outside the scope of this work. While it is possible that some projectized organizations could be classified as Type 4 organizations, this seems improbable based on the lack of technology application (Auth et al., 2019; PMI, 2019) and organizational structures supporting digital transformation (Guinan et al., 2019; Lavikka et al., 2018) in projectized organizations.

The results or outputs of the PMO actions outlined on the Type 1, Type 2, and Type 3 paths are increased dynamic capabilities of sensing, seizing, and reconfiguring. Because dynamic capabilities help organizations respond to change (Lacruz et al., 2019), developing such capabilities in projectized organizations can be meaningfully linked to digital transformation, since that process is one of continual change (Holgeid et al., 2018; Zaki, 2019). While dynamic capabilities are broadly challenging to measure (Kump et al., 2019), there is the opportunity to measure the outcomes of this process because of the scholarship, which has examined the topics of digital skills, design thinking, and benefits realization directly.

The digital hub paths prescribed for Type 1-3 situations each offer points of measurement that an organization can use to assess maturity and growth related to digital transformation implementation through the PMO. For Type 1 situations, the measurable outputs would be numbers of staff trained, an increase in digital skills for current technology and software (Koseoglu et al., 2019), an increase in digital skills for emerging technology and software (Sousa & Rocha, 2019), and the creation of an internal skills network (Morgan, 2019). For Type 2

Table 1

Expected Outputs from Digital Transformation Paths

Organizational Type	Expected Outputs
Type 1 - Digital Skills Path	Number of staff trained Increase in digital skills for current technology/software (Koseoglu et al., 2019) Increase digital skills for emerging technology (Sousa & Rocha, 2019) Creation of an internal skills network (Morgan, 2019)
Type 2 - Benefits Realization Path	Use of benefit management tools (PMI, 2018c) PMO ownership of digital benefits realization post-project (Zwikael et al., 2019) Target benefits achieved such as reduced project costs and shortened duration (Didehvar et al., 2018; Sousa & Rocha, 2019)
Type 3 - Design Thinking Path	Number of projects using design thinking techniques such as customer journey mapping, personas, or storytelling (Fehér & Varga, 2019; Sergeeva & Triflova, 2018) Innovative solutions from projects (Albaidhani & Torres, 2018)

situations, the measurable outputs are the increased use of benefits management plans, the increased use of benefits management tools (PMI, 2018c), PMO ownership of digital benefits realization post-project (Zwikael et al., 2019), and the increased achievement of target benefits such as reduced project costs and shortened project duration (Didehvar et al., 2018; Sousa & Rocha 2019). For Type 3 situations, measurable outcomes would include the number of projects using design thinking techniques and more innovative solutions arising from projects (Albaidhani & Torres, 2018). In addition to understanding these outputs, evaluating the strengths and weaknesses of this solution provides a clear picture of the value and appropriate scope of this solution.

Evaluation of the Solution

Table 2

Strengths and Weaknesses of the Proposed Solution

Strengths	Weaknesses
Applicable across industries	Lack of organizational assessment method
Relevant even as technology evolves	Classifications lack nuance
Cost-conscious	Does not address risks of digital transformation
Addresses digital skills barrier	

This solution has several strengths, presented in Table 2, including addressing several of the barriers to digital transformation identified in scholarly literature. One strength of this solution is that this solution is applicable to projectized organizations across industries. The range of organizations that can use this solution supports the solution's value. Another strength is that this solution focuses on the abilities necessary to support the ongoing work of digital transformation. This is appropriate, as opposed to providing specific instructions for one type of innovation, given the continued evolution of digital technology and its impact (Warner & Wäger, 2019). An additional strength is that this solution provides incremental steps towards digital transformation, which can be completed through the PMO as opposed to requiring costly systems updates. Thus, this solution helps avoid some of the cost, which is a barrier to digital transformation (Kelly & Ilozor, 2019; Koseoglu et al., 2019; Sánchez & Zuntini, 2018). Finally, another strength is that this solution addresses the barrier of lack of digital skills (Sousa & Rocha, 2019; Koseoglu et al., 2019) by categorizing organizations based on technology proficiency (Tekic & Koroteev, 2019). Developing digital skills is presented as a key first step for the least prepared organizations that lack technology proficiency and organizational readiness. All of these strengths point towards the value, applicability, and scholarly support of this solution.

This solution also has weaknesses related to organizational assessment methods, broad classifications, and the risk related to using digital technology in the work of projectized organizations. A significant weakness of this solution is that it does not address how to assess technology proficiency or organizational readiness, as necessary to apply Tekic and Koroteev's (2019) matrix model. Tekic and Koroteev (2019) also did not address how to do such classification, so this would be an area for future research. Also, a weakness is that the assessment model and solution are based on four general classifications. Although such distinctions should support more focused and appropriate digital transformation efforts (Tekic & Koroteev, 2019), this system does not address the full range of complexities that may be present in an organization. A final weakness is that this solution does not address the risk components of using digital technology such as predicting what digital innovation will be best in the long term (Lavikka et al., 2018), or navigating the difference in timelines between projects designed for the long-term and technology that evolves quickly (Martinsuo, 2019; Whyte, 2019). In addition to considering these strengths and weaknesses, an organization or PMO desiring to implement this solution should also consider the relevant scope of this solution.

This solution is limited to projectized organizations with a PMO. This solution is centered around the concept of the PMO in a projectized organization, that is the organizational component responsible for various work related to project management at the organization (Aubry, 2015). This solution is not applicable to organizations without PMOs or units with the same responsibilities. Other organizational forms such as network administrative organizations may have similar roles and responsibilities to the PMO (Braun, 2018; Lacruz et al., 2019). This solution may be applicable to similar entities not called PMOs, if those entities act in the same way a strategic PMO would. Additionally, organizations may have multiple PMOs (Kaul &

Joslin, 2019). In such a situation, this solution may or may not be applicable, depending on the types and influence of each PMO. Also, the scope is limited to organizations with a strategic PMO or a PMO that has the ability to conduct strategic work, in comparison to the tactical PMOs present at some organizations. Tactical PMOs are focused on project delivery, particularly schedule and budget functions (Bredillet et al., 2018a; Müller et al., 2019), and would thus not have the reach or influence necessary to implement this solution.

Summary

Considering the challenge of digital transformation and the preexisting structure of the PMO in projectized organizations, this model of the PMO as a digital hub offers multiple paths to implementing digital transformation through the PMO. These paths are based on an assessment of technology proficiency and organizational readiness (Tekic & Koroteev, 2019). Each of these paths provides direction for PMO actions that fall within the scope of strategic PMOs related to training, project management methodology, and project management best practices (Bredillet et al., 2018a; Müller et al., 2019). This solution is broadly applicable across projectized organizations with PMOs.

For organizations, divisions, portfolios, or programs categorized as Type 1, the PMO is charged with developing the digital skills of project managers and team members. For Type 2 situations, the PMO's focus is to be on incorporating benefits realization into the organization's best practices increasing the realization of benefits from digital technology usage. For Type 3 situations, the PMO is to offer design thinking methods and tools. Type 4 organizations are likely to be startups (Tekic & Koroteev, 2019) and are outside of this solution's scope.

Overall, this solution outlines practical paths for PMOs to implement digital transformation in projectized organizations so that those organizations can produce greater value

through projects. Not only do the recommended actions fall within the domain of the PMO (van der Linde & Styne, 2016; Szalay et al., 2017; Darling & Whitty, 2016), this work also supports organizational project management maturity (Chanias et al., 2019; Hinings et al., 2018; Hubbard & Rogers, 2018; Lobo & Whyte, 2017; PMI, 2018b; Warner & Wäger, 2019). Thus, the solution offers value to a number of projectized organizations through direct and indirect avenues. In the next chapter, an implementation plan for the digital hub PMO model is presented.

Discussion

A model of the PMO as a hub for digital transformation in a projectized organization, based on a review and synthesis of literature on digital transformation, PMOs, and related topics is presented in Chapter 3. This model is a new concept for projectized organizations, given the lack of frameworks for digital transformation in such organizations (Cavalieri & Saisse, 2019) and further exemplified by the lack of digital project teams, even in the IT industry (Guinan et al., 2019). Thus, a plan for implementing this model in projectized organizations is necessary. This chapter includes an overview and detailed description of the proposed implementation plan, the assumptions and limitations of the solution, and areas for future research.

The three different PMO action paths outlined in the solution can be established through an implementation plan based on the knowledge management lifecycle as presented by PMI (PMI, 2018b). These action paths are: (1) developing the digital skills of project managers and staff, 2) implementing benefits realization best practices to realize digital benefits, and (3) incorporating design thinking into the organization's project management methodology. Building PMO capabilities in each of these three areas is the goal of the implementation plan presented in this chapter.

While these action paths align with established PMO responsibilities, sufficient preparation and PMO expertise will need to be developed in the topic areas of digital skills, design thinking, and benefits realization. The PMO must have mastery of relevant digital skills, use of design thinking in project management, and application of benefits realization best practices before guiding the organization and organization's project managers to master these topic areas. Ultimately, the PMO must implement this model internally before leveraging this model to implement digital transformation in the projectized organization.

Overview of Implementation Plan

This implementation plan provides a guide for developing a PMO into a hub for digital project management. The hub model includes three PMO action paths—digital skills, design thinking, and benefits realization—recommended based on an organizational assessment of digital transformation readiness (Tekic & Koroteev, 2019). Thus, the main steps of this implementation plan are: (1) confirming or enhancing the strategic role of the PMO, (2) developing the capacity to provide digital skills training, (3) developing the capacity for design thinking methods, and (4) developing the capacity for effective benefits realization practices. Since the activities recommended for digital transformation through the PMO vary based on organizational classification (Tekic & Koroteev, 2019), not all of the paths in this implementation plan may be necessary for all PMOs.

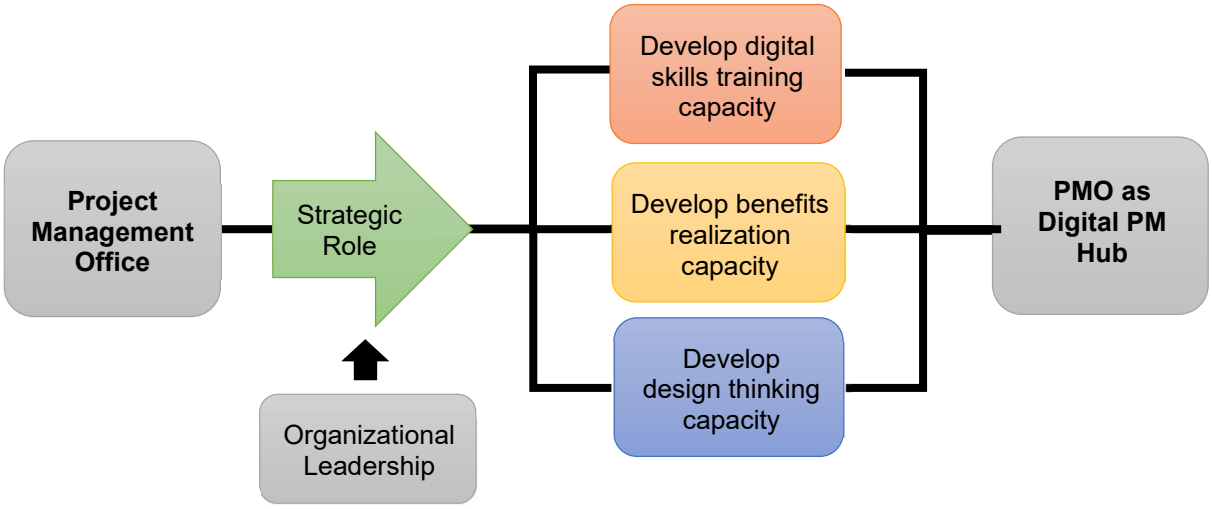

Figure 3. Digital PM Hub Implementation Model. A model providing an overview of the proposed implementation plan for transforming the PMO into the digital project management hub at a projectized organization.

This implementation plan directly supports the solution by providing for the development of a strategic PMO equipped to support digital transformation through the recommended action

paths. Strategic PMOs are distinct from tactical PMOs that support the delivery of specific projects or programs (Bredillet et al., 2018a; Müller et al., 2019). Strategic PMOs are necessary for digital transformation activities because of their organization-level focus (Müller et al., 2019). Furthermore, the desired outcomes of the solution are dynamic capabilities, which are strategic in nature (Lobo & Whyte, 2017; Orji, 2019; Sánchez & Zuntini, 2018), supporting the need for a strategic PMO to provide this solution.

Additionally, this implementation plan supports the solution presented in Chapter 3 by addressing capacity development for each of the three action paths proposed to build dynamic capabilities for digital transformation. These action paths necessitate PMO knowledge of and proficiency in each topic area. Thus, knowledge and capabilities must be built up in the PMO so that the PMO can share such knowledge and capabilities across the organization, as the PMO does with project information (Lacruz et al., 2019; Riis et al., 2019; Szalay et al., 2017) and project management best practices (Aubry & Hobbs, 2011; Bredillet et al., 2018a; Hubbard & Rogers, 2018). A closer look at this implementation plan provides a better view of the specific steps required to build knowledge and capabilities in the PMO for each of these action paths.

Description of Implementation Plan

The first step of this implementation plan is to make sure that the PMO in question is a strategic PMO. Ensuring that the specific PMO has strategic influence is important because PMO types vary, as evidenced from scholarly literature (Bredillet et al., 2018a; Kaul & Joslin, 2019; Müller et al., 2019; Sandhu, Al Ameri, & Wikström, 2019). A PMO without strategic focus, or one with mixed strategic and tactical responsibilities, will need to be empowered by organization leadership to take on these strategic activities, since leadership support is key for effective digital transformation (Bredillet et al., 2018a; Morgan, 2019). This empowerment may

take the form of giving the PMO authority over projects across the organization (Müller et al., 2019), if the PMO was only limited to a certain division or type of project. It could also take the form of clearly distinguishing between the strategic PMO and tactical PMO by designating the PMO an enterprise PMO (EPMO) or organization-wide PMO (OPMO) (Müller et al., 2019). Ensuring that the PMO has a strategic focus could also be achieved by increasing the connection between PMO responsibilities and the projectized organization's strategic plan (Sandhu et al., 2019). Once the PMO is properly positioned to have strategic scope, the next step of this implementation plan is developing digital transformation capabilities within the PMO.

The process of developing digital skills, design thinking, and benefits realization capabilities can be implemented following the knowledge management lifecycle presented by PMI (PMI, 2018b).

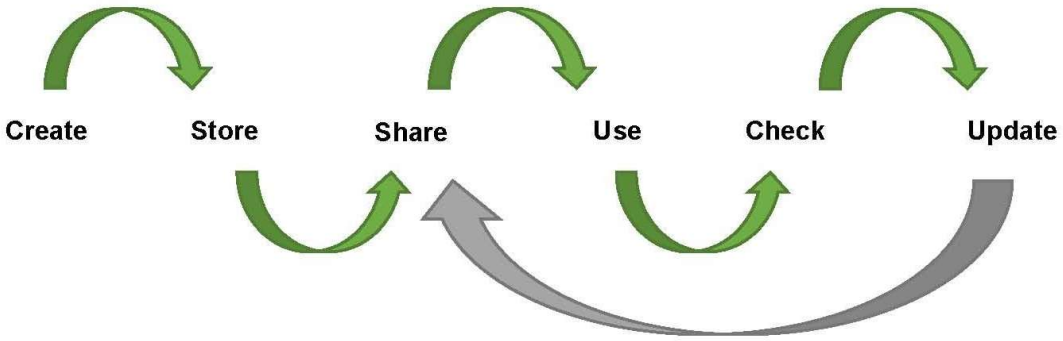

Figure 4. PMI Knowledge Management Lifecycle Diagram. The Knowledge Management Life Cycle according to PMI (2018b).

This knowledge management lifecycle includes the steps of creating, sharing, using, checking, and updating knowledge (PMI, 2018b). The create step requires the PMO to conduct an assessment to determine gaps where knowledge is needed, then create that knowledge (PMI, 2018b). The share step involves making people in the organization aware that the PMO has such knowledge (PMI, 2018b). The store step requires PMOs to make knowledge organized and

accessible (PMI, 2018b). For the use step, the PMO must provide guidance about how to use the knowledge (PMI, 2018b). Finally, the check and update steps involve periodic review and revision of the PMO's knowledge to ensure the knowledge is truly reflective of industry standards and best practices (PMI, 2018b). To implement the solution presented in Chapter 3, this knowledge management lifecycle must be applied to the specific areas of digital skills, design thinking, and benefits realization capacity development.

Developing digital skills training capacity based on the knowledge management lifecycle should result in digitally skilled PMO staff and digital skills training options appropriate for the projectized organization's industry context. A gap analysis that identifies digital skills deficiencies will be necessary. PMOs should also identify and recruit subject matter experts in key digital skills areas such as AI, nanotechnology, robotization, the Internet of Things, augmented reality, and digitalization (Sousa & Rocha, 2019). Creation of knowledge would be accomplished by developing training materials, educational courses, or consultant seminar schedules. The store, share, and use steps can be accomplished by creating communities of practice, such as an internal skills network in the form of a searchable, interactive online space (Morgan, 2019). Check and update steps could be accomplished by assigning PMO staff time to conduct regular environmental analysis and follow digital innovation trends and then revising training materials or updating the community of practice as appropriate. These two steps will be particularly vital given the rapid developments, which characterize the digital business environment (Orji, 2019; Sousa & Rocha, 2019; Whyte, 2019).

Implementing benefits realization capacity should lead to the incorporation of benefits realization practices, both during the project lifecycle and the critical post-project period (Zwikael et al., 2019). Because PMI offers a comprehensive guide on the subject, the creation

step can center around understanding and applying this standard (PMI, 2018c). Again, storing, sharing, and using this knowledge will involve adding or enhancing the PMO's project management resources and guidance to incorporate benefits realization best practices. Specifically, this may include adding emphasis on benefits realization into project initiation documents, such as business cases (Romero et al., 2017) and developing templates for benefit realization management plans, benefits profiles, benefits registers, benefits maps and benefits traceability matrices (PMI, 2018c). Check and update steps can be accomplished through periodic reviews, particularly of any updates to the PMI standard (PMI, 2018c).

Developing design thinking capacity should result in the incorporation of design thinking elements into the project management resources and guidance provided by the PMO so that the PMO can spread the use of design thinking throughout the organization. For this area, the PMO should evaluate which design thinking practices are appropriate for their specific industry context, particularly if the practices of storytelling or scenario planning are viable, since those have shown promise for innovation and digital transformation (Lavikka et al., 2018; Seergeva & Trifilova, 2018). Creating this knowledge would consist of determining how to incorporate design thinking techniques into the normal project management processes and methodology of the organization. Storing, sharing, and using this knowledge requires incorporating design thinking steps into templates or checklists provided by the PMO; sharing such updates with project managers at the organization; and developing FAQs, Q&A, or interactive communication options to aid the development of design thinking in practice. Checking and updating design thinking materials would need to be assigned to a PMO staff member. By following these specific steps, based on PMI's knowledge management lifecycle (PMI, 2018b), the PMO can

develop into the hub for digital project management and thus digital transformation in the projectized organization.

Assumptions

A significant assumption of this solution and implementation plan is that the organization in question has a PMO. Although PMOs have been common since the 1990s (Aubry, Hobbs, & Thuillier, 2007; Barun, 2018) not all organizations have PMOs. PMI found that 32% of the organizations they surveyed did not have a formal PMO (PMI, 2018a). This solution is not meaningful for organizations without a preexisting PMO. A projectized organization without a PMO may want to consider establishing a PMO. However, doing so for the primary purpose of digital transformation may not be a resource-conscious way of achieving that goal. Organizations in this position may be able to leverage other preexisting offices or units to guide digital transformation. This model could inform such efforts, but it was not designed for those situations where a PMO is not present.

Additionally, this solution is also based on the key assumption that an organization has digital transformation in its strategy, strategic plan, or goals and objectives. Lack of digital transformation as a priority or consideration within an organization's strategy is likely to impede digital transformation efforts (Sklyar et al., 2019), such as those prescribed for the PMO in this solution. Furthermore, inclusion of digital transformation in an organization's strategy goes hand-in-hand with leadership support, which legitimizes digital transformation efforts (Morgan, 2019). If digital transformation is not a priority at all for the projectized organization, the efforts proposed in this solution may be met with resistance and not constitute an appropriate use of PMO time. In that scenario, the organization would first need to grasp the value and opportunities of digital transformation before considering the application of this solution.

Ultimately, if the organization is not pursuing or willing to pursue digital transformation, the proposed solution is irrelevant.

This solution is also based on the assumption that an organization has or is willing to allocate resources and capacity within the PMO for digital transformation efforts. Although this solution is a cost-effective method of pursuing digital transformation, since it does not require the creation of a new organizational unit, implementation does require some availability and capacity within the PMO. Devoting PMO capacity to digital transformation rather than other initiatives will require organizational leadership support for digital transformation work. The challenge of building digital transformation capabilities without taking resources away from other areas has been recognized (Svahn et al., 2017). Furthermore, the research of Fainshmidt et al. (2019) highlighted the significant importance of resources in an organization's ability to deploy dynamic capabilities. If a PMO is at capacity and the organization cannot devote resources to additional staff or staff time, it will be challenging, perhaps prohibitively so, to implement this solution. Thus, resource availability is a major assumption.

Limitations

In addition to the underlying assumptions, there are also limitations intrinsic to this solution. One limitation of this solution is that it does not assess how to create organizational readiness for digital transformation. While the recommendation regarding employee skill development addresses the development of the technology proficiency side of Tecik and Koroteev's (2019) matrix, no recommendation is provided for increasing organizational readiness. Rather, the recommendations are designed to create impact based on the current state of organizational readiness.

Another limitation of this solution and implementation plan is that it does not provide a tool for determining what digital skills are relevant for an organization. Digital skills can encompass a variety of areas including AI, nanotechnology, robotization, the Internet of Things, augmented reality, and digitalization (Sousa & Rocha, 2019). However, not all of these skills will be applicable at every projectized firm, and no tool is provided for selecting the appropriate areas for training development. A projectized organization with little digital experience may need additional guidance on digital options and applications before pursuing digital transformation as outlined in this solution.

This solution also does not address the potential of overlap between the PMO and the enterprise project management office (EPMO) at organizations that have both. Since EPMOs will have a strategic function and influence (PMI, 2018a), there is potential that this framework should be applied to EPMOs rather than PMOs at organizations that have both. However, that could be challenging if the PMO is still handling project management methodology, procedures and templates. Relevant considerations and the distinctions between EPMOs and PMOs are not addressed in this solution or implementation plan.

A final limitation is that this solution is based only on scholarly work published in English and that the solution has not been empirically tested. Scholarly work in other languages could provide additional insights. Scholarly work not published in English could support the model of the PMO as a digital hub or could highlight issues not accounted for in this solution. Additionally, application of this solution may reveal weakness of the solution, prerequisites that were not previously identified, or additional steps needed to implement the solution. These and the other identified limitations establish the context and applicable scope of the proposed solution, context and scope, which could be expanded through future research.

Future Research

One area for future research is determining how to create or enhance organizational readiness. This solution is based on assessing current organizational readiness and choosing an action path accordingly (Tecik & Koroteev, 2019). Increased organizational readiness enables greater digital transformation work and may result in projectized organizations being able to engage in disruptive behavior. While this is valuable for digital transformation, it is outside of the scope of this solution (Tecik & Koroteev, 2019). Thus, future research on how projectized organizations can build organizational readiness would illuminate the next step for projectized organizations progressing towards disruptive digital transformation.

Another area for future research is determining which digital skills are relevant and valuable for projectized organizations. The value of certain digital skills, such as building information modeling (BIM) skills in construction is recognized (Koseoglu et al., 2019). Hover the relevance of other emerging digital skills was not examined, particularly in the context of projectized organizations and digital project management. Such future research would aid projectized organizations in conducting a gap analysis of relevant digital skills and or consulting subject matter experts, as suggested in this implementation plan.

One area for future research is how this model for digital transformation through the PMO is applied in a setting with multiple PMOs or an organizational setting that includes an EPMO and a PMO. Multiple connected PMOs exist in some organizations, but questions of the value of such arrangement and how to navigate it remain (Kaul & Joslin, 2019). Because EPMOs have a strategic reach (PMI, 2018a), it is possible that PMOs in such contexts are primarily tactical, making the framework applicable to EPMOs. Additional understanding of

EPMOs, their functions and relationships to PMOs would be necessary to make such a determination.

Another area for future research is how to address the challenge of risk that is associated with digital innovation. The rapid pace of technology development requires quick adoption of new technology to sustain competitive edge (Witschel et al., 2019). However, this pace introduces risk, since new technology that is implemented poorly or rejected by end users will not prove financially beneficial (Cavalieri & Saisse, 2019; Martinsuo, 2019). Additionally, the difference between the functional timeline of large megaprojects such as buildings and bridges and the timeline of digital innovation introduces risk (Whyte, 2019). Future research should examine ways to address this risk in the process of digital transformation.

Effective data management in digital transformation is another area for future research. Digital innovation based on big data requires data gathering (Ekambaram et al., 2018). To leverage that data, appropriate structures and controls to ensure data integrity must be in place (Whyte et al., 2016). High quality data analysis is thus a prerequisite for digital transformation with big data (Zaki, 2019). Additional research is needed to determine how projectized organizations can collect, manage, and analyze data for digital transformation.

Additionally, future research may be necessary to address the challenge of standardization associated with digital transformation. Integration challenges between software applications or operating systems increase the costs and challenges of digital transformation (Braun & Sydow, 2019; Senyo et al., 2019; Wang et al., 2019). Such challenges may make the effort of digital transformation seem not worthwhile, despite the general need for digital transformation to remain competitive (Didehvar et al., 2018; Hubbard & Rogers, 2018; Morgan,

2019; Pramanik et al., 2019; Wang et al., 2019). Additional research could examine appropriate methods for standardizing digital transformation at a projectized organization.

Another area for future research is on continuous improvement of digital transformation in the projectized organization. Due to the continued evolution of technology, digital transformation cannot be achieved and then put aside (Whyte, 2019). Continued efforts on the part of the organization will be necessary to maintain a state of digital transformation (Warner & Wäger, 2019). Thus, future research is needed to determine how continuous improvement could be incorporated into the use of this model. Determining if organizations should revisit the assessment step (Tekic & Koroteev, 2019) and how often it is necessary to do so would be a valuable addition to this work.

Finally, future research that examines or tests this model in practice would be valuable for validating the model. Future research could incorporate the findings of research published in other languages. Additionally, future research could measure the digital maturity of organizations before and after implementing the model. Future research based on the application of this model could be used to identify barriers to implementation that should be addressed for projectized organizations to undertake digital transformation.

Conclusion

Given the benefits of digital transformation for remaining competitive in the digital business environment (Chanias et al., 2019; Hubbard & Rogers, 2018; Sousa & Rocha, 2019), pursuit of digital transformation is worthwhile for projectized organizations. Projectized organizations have the opportunity to use the existing structure of the PMO to meet the current need of digital transformation, but a model for digital transformation via the PMO had not previously been developed (Cavalieri & Saisse, 2019). This solution contributes to the field of

project management scholarship by providing a framework for projectized organizations to address the competitive demand for using digital innovation and gain related benefits while leveraging a preexisting organizational structure. Furthermore, the model presented in this study contributes to the project management scholarship on the PMO and its evolution (Sandhu et al., 2019; van der Linde & Styne, 2016) by presenting a new area of PMO applicability.

This model of the PMO as the hub for digital project management was developed based on a review of scholarly literature addressing digital transformation, dynamic capabilities, motivations for digital transformation, constructs in digital transformation, digital transformation in projectized organizations, barriers, support factors, benefits realization, PMO types and roles, and the use of PMOs in strategic work. To create this solution, scholarship related to digital transformation at organizations in general was critically integrated with scholarship examining projectized organizations, the history and change of PMOs, and organizational project management.

Implementation of this solution should result in a PMO that is a centralized source for digital project management at the organization where it resides. Such a PMO is on the front end of innovation, equipping the organization appropriately based on organizational characteristics. Organizations with PMOs who adopt this model should have stronger dynamic capabilities as a result of this solution, enabling these organizations to keep up with the rapid pace and major demands of digital technology change (Lacruz et al., 2019, Warner and Wäger, 2019; Zaki, 2019). Furthermore, greater organizational project management maturity is expected at these organizations that deliberately pursue digital transformation through the PMO because of the close connections between digital transformation results and organizational project management maturity (PMI, 2018b).

For projectized organizations and project management, the question is not if digital innovation will be used but rather how it will happen (Witschel et al., 2019). The pressure to adopt digital innovation should only increase as technology improves. This solution presents a defined path towards digital transformation, something that is missing in projectized organizations and organizations at large (Cavalieri & Saisse, 2019; Moreira et al., 2018; Witschel et al., 2019). Overall, this solution provides a guide to projectized organizations for adapting project management to the demands of digital technology and ultimately remaining competitive in the digital era.

References

Abdellatif, T. M., Capretz, L. F., & Ho, D. (2019). Automatic recall of software lessons learned for software project managers. *Information & Software Technology*, *115*, 44–57. https://doi.org/10.1016/j.infsof.2019.07.006

Albaidhani, I., & Torres, A. R. (2018). When project meets innovation: Pro-innova conceptual model. *Journal of Modern Project Management*, *5*(3) 56–61. Retrieved from https://www.journalmodernpm.com/

Altukhova, N., Vasileva, E., & Yemelyanov, V. (2018). How to add value to business by employing digital technologies and transforming management approaches. *Business Management / Biznes Upravlenie*, *2018*(1), 71–84. Retrieved from http://bm.uni-svishtov.bg/

Artto, K., Kulvik, I., Poskela, J., & Turkulainen, V. (2011). The integrative role of the project management office in the front end of innovation. *International Journal of Project Management*, *29*, 408–421. https://doi.org/10.1016/j.ijproman.2011.01.008

Aubry, M. (2015). Project management office transformations: Direct and moderating effects that enhance performance and maturity. *Project Management Journal*, *46*, 19–45. https://doi.org/10.1002/pmj.21522

Aubry, M., & Brunet, M. (2016). Organizational design in public administration: Categorization of project management offices. *Project Management Journal*, *47*, 107–129. https://doi.org/10.1177/875697281604700508

Aubry, M., & Hobbs, B. (2011). A fresh look at the contribution of project management to organizational performance. *Project Management Journal*, *42*(1), 3–16. https://doi.org/10.1002/pmj.20213

Aubry, M., Hobbs, B., & Thuillier, D. (2007). A new framework for understanding organisational project management through the PMO. *International Journal of Project Management*, *25*, 328–336. https://doi.org/10.1016/j.ijproman.2007.01.004

Aubry, M., Sicotte, H., Drouin, N., Vidot-Delerue, H., & Besner, C. (2012). Organisational project management as a function within the organisation. International Journal of *Managing Projects in Business*, *5*(2), 180–194. https://doi.org/10.1108/17538371211214897

Auth, G., Jokisch, O., & Dürk, C. (2019). Revisiting automated project management in the digital age - a survey of AI approaches. *Online Journal of Applied Knowledge Management*, *7*(1), 27–39. Retrieved from http://www.iiakm.org/ojakm/index.php

Bauer, E. H. W., Schlund, S., Hornung, T., & Schuler, S. (2018). Digitalization of industrial value chains: A review and evaluation of existing use cases of Industry 4.0 in Germany. *LogForum*, *14*, 331–340. https://doi.org/10.17270/J.LOG.2018.288

Braun, T. (2018). Configurations for interorganizational project networks: The interplay of the PMO and network administrative organization. *Project Management Journal*, *49*(4), 53–61. https://doi.org/10.1177/8756972818781710

Braun, T., & Sydow, J. (2019). Selecting organizational partners for interorganizational projects: The dual but limited role of digital capabilities in the construction industry. *Project Management Journal*, *50*, 398–408. https://doi.org/10.1177/8756972819857477

Bredillet, C., Tywoniak, S., & Tootoonchy, M. (2018a). Exploring the dynamics of project management office and portfolio management co-evolution: A routine lens. *International Journal of Project Management*, *36*, 27–42. https://doi.org/10.1016/j.ijproman.2017.04.017

Bredillet, C., Tywoniak, S., & Tootoonchy, M. (2018b). Why and how do project management offices change? A structural analysis approach. *International Journal of Project Management*, *36*, 744–761. https://doi.org/10.1016/j.ijproman.2018.04.001

Cavalieri, A. M. B., & Saisse, M. C. P. (2019). Hybrid project management for sociotechnical digital transformation context. *Brazilian Journal of Operations & Production Management*, *16*, 316–332. https://doi.org/10.14488/BJOPM.2019.v16.n2.a12

Chae, B. (2019). A general framework for studying the evolution of the digital innovation ecosystem: The case of big data. *International Journal of Information Management*, *45*, 83–94. https://doi.org/10.1016/j.ijinfomgt.2018.10.023

Chanias, S., Myers, M. D., & Hess, T. (2019). Digital transformation strategy making in pre-digital organizations: The case of a financial services provider. *Journal of Strategic Information Systems*, *28*(1), 17–33. https://doi.org/10.1016/j.jsis.2018.11.003

Darling, E., & Whitty, S. (2016). The project management office: It's just not what it used to be. *International Journal of Managing Projects in Business*, *9*, 282-308. https://doi.org/10.1108/IJMPB-08-2015-0083

Didehvar, N., Teymourifard, M., Mojtahedi, M., & Sepasgozar, S. (2018). An investigation on virtual information modeling acceptance based on project management knowledge areas. *Buildings*, *8*(6), 1-19. https://doi.org/10.3390/buildings8060080

Einhorn, F., Marnewick, C., & Meredith, J. (2019). Achieving strategic benefits from business IT projects: The critical importance of using the business case across the entire project lifetime. *International Journal of Project Management*, *37*, 989–1002. https://doi.org/10.1016/j.ijproman.2019.09.001

Ekambaram, A., Sørensen, A. Ø., Bull-Berg, H., & Olsson, N. O. E. (2018). The role of big data and knowledge management in improving projects and project-based organizations. *Procedia Computer Science*, *138*, 851–858. https://doi.org/10.1016/j.procs.2018.10.111

Fainshmidt, S., Wenger, L., Pezeshkan, A., & Mallon, M. R. (2019). When do dynamic capabilities lead to competitive advantage? The importance of strategic fit. *Journal of Management Studies*, *56*, 758–787. https://doi.org/10.1111/joms.12415

Fehér, P., & Varga, K. (2019). Digital transformation in the Hungarian banking industry: Experiences with design thinking. *Society & Economy*, *41*, 293–310. https://doi.org/10.1556/204.2019.41.3.2

Fister Gale, S. (2019). Premium on digital: Triglav Croup's PMO help the insurance company grow and transform. *PM Network*, *33*(2), 64–69. Retrieved from https://www.projectmanagement.com/PM-Network/

Gemünden, H. G., Lehner, P., & Kock, A. (2018). The project-oriented organization and its contribution to innovation. *International Journal of Project Management*, *36*, 147–160. https://doi.org/10.1016/j.ijproman.2017.07.009

Gomes, J., & Romão, M. (2018). Achieving dynamic capabilities through the benefits management approach. *International Journal of Information Systems in the Service Sector*, *10*(2), 53-68. https://doi.org/10.4018/ijisss.2018040104

Graf, C. O., & Seelhofer, D. (2018). National project management maturity: A conceptual framework. *Central European Business Review*, *7*(2), 1–20. https://doi.org/10.18267/j.cebr.196

Guinan, P. J., Parise, S., & Langowitz, N. (2019). Creating an innovative digital project team: Levers to enable digital transformation. *Business Horizons*, *62*, 717–727. https://doi.org/10.1016/j.bushor.2019.07.005

Hinings, B., Gegenhuber, T., & Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. *Information and Organization*, *28*(1), 52–61. https://doi.org/10.1016/j.infoandorg.2018.02.004

Hobbs, B., & Aubry, M. (2008). An empirically grounded search for a typology of project management offices. *Project Management Journal*, *39*, S69–S82. https://doi.org/10.1002/pmj.20061

Holgeid, K., Stray, V., Krogstie, J., & Thompson, M. (2018). Strategizing for successful IT projects in the digital era. *International Research Workshop on IT Project Management 2018*, 6. Retrieved from https://aisel.aisnet.org/irwitpm2018/6

Hubbard, D. G., & Rogers, P. W. (2018). Innovation ecosystem management leadership in project management and business. *PM World Journal*, *7*(7), 1-32. Retrieved from https://pmworldlibrary.net/readers/pm-world-journal/

Ifenthaler, D., & Egloffstein, M. (2020). Development and Implementation of a Maturity Model of Digital Transformation. *TechTrends: Linking Research & Practice to Improve Learning*, *64*, 302–309. https://doi.org/10.1007/s11528-019-00457-4

Kaul, P., & Joslin, R. (2019). How increasing projectification and temporality have changed the way we look at project management offices: A systematic literature review. *PM World Journal*, *8*(4), 1–22. Retrieved from https://pmworldlibrary.net/readers/pm-world-journal/

Kelly, D., & Ilozor, B. (2019). A quantitative study of the relationship between project performance and BIM use on commercial construction projects in the USA. *International Journal of Construction Education and Research*, *15*(1), 3-18. https://doi.org/10.1080/15578771.2016.1202355

Koseoglu, O., Keskin, B., & Ozorhon, B. (2019). Challenges and enablers in BIM-enabled digital transformation in mega projects: The Istanbul new airport project case study. *Buildings*, *9*(5), 1-24. https://doi.org/10.3390/buildings9050115

Kump, B., Engelmann, A., Kessler, A., & Schweiger, C. (2019). Toward a dynamic capabilities scale: Measuring organizational sensing, seizing, and transforming capacities. *Industrial & Corporate Change*, *28*, 1149–1172. https://doi.org/10.1093/icc/dty054

Kutsch, E., Ward, J., Hall, M., & Algar, J. (2015). The contribution of the project management office: A balanced scorecard perspective. *Information Systems Management*, *32*, 105–118. https://doi.org/10.1080/10580530.2015.1018768

Lacruz, A. J., Cunha, E. A., de Moura, R. L., & de Oliveira, M. P. V. (2019) Project management office in the nongovernmental organization as a driver of sustainable competitive advantage: A dynamic capabilities approach. In M. Peris-Ortiz, J. Ferreira & J. Merigó Lindahl (Eds.), *Knowledge, innovation and sustainable development in organizations* (pp. 23-37). https://doi.org/10.1007/978-3-319-74881-8_3

Lavikka, R., Kallio, J., Casey, T., & Airaksinen, M. (2018). Digital disruption of the AEC industry: Technology-oriented scenarios for possible future development paths. *Construction Management and Economics*, *36*, 635-560. https://doi.org/10.1080/01446193.2018.1476729

Lavoie-Tremblay, M., Aubry, M., Cyr, G., Richer, M.C., Fortin-Verreault, J.F., Fortin, C., & Marchionni, C. (2017). Innovation in health service management: Adoption of project management offices to support major health care transformation. *Journal of Nursing Management*, *25*, 657-665. https://doi.org10.1111/jonm.12505

Lavoie-Tremblay, M., Aubry, M., Richer, M.C., Guylaine, C. Y. R. (2018). A health care project management office's strategies for continual change and continuous improvement. *The Health Care Manager*, *37*(1), 4-10. https://doi.org/10.1097/HCM.0000000000000185

Lewkowicz, M., & Liron, R. (2019). The missing "turn to practice" in the digital transformation of industry. *Computer Supported Cooperative Work: The Journal of Collaborative Computing*, *28*, 655–683. https://doi.org/10.1007/s10606-019-09347-y

Lobo, S., & Whyte, J. (2017). Aligning and reconciling: Building project capabilities for digital delivery. *Research Policy*, *46*(1), 93–107. https://doi.org/10.1016/j.respol.2016.10.005

Love, P. E. D., & Matthews, J. (2019). The 'how' of benefits management for digital technology: From engineering to asset management. *Automation in Construction*, *107,* 1-15. https://doi.org /10.1016/j.autcon.2019.102930

Mahmoud-Jouini, S., Midler, C., & Silberzahn, P. (2016). Contributions of design thinking to project management in an innovation context. *Project Management Journal*, *47*, 144–156. https://doi.org/10.1002/pmj.21577

Martinsuo, M. (2019). Strategic value at the front end of a radical innovation program. *Project Management Journal, 50*, 431-446. https://doi.org/10.1177/8756972819853438

Matthews, J., Love, P. E. D., Mewburn, J., Stobaus, C., & Ramanayaka, C. (2018). Building

information modelling in construction: Insights from collaboration and change management perspectives. *Production Planning & Control*, *29*, 202–216. https://doi.org/10.1080/09537287.2017.1407005

Monteiro, A., Santos, V., & Varajão, J. (2016). Project management office models: A review. *Procedia Computer Science*, *100*, 1085–1094. https://doi.org/10.1016/j.procs.2016.09.254

Moreira, F., Ferreira, M. J., & Seruca, I. (2018). Enterprise 4.0: The emerging digital transformed enterprise? *Procedia Computer Science*, *138*, 525-534. https://doi.org/10.1016/j.procs.2018.10.072

Morgan, B. (2019). Organizing for digitalization through mutual constitution: The case of a design firm. *Construction Management & Economics*, *37*, 400-417. https://doi.org /10.1080/01446193.2018.1538560

Mousavi, S., Bossink, B., & van Vliet, M. (2018). Dynamic capabilities and organizational routines for managing innovation towards sustainability. *Journal of Cleaner Production*, *203*, 224–239. https://doi.org/10.1016/j.jclepro.2018.08.215

Müller, R., Drouin, N., & Sankaran, S. (2019). Modeling organizational project management. *Project Management Journal*, *50*(4), 499–513. https://doi.org/10.1177/8756972819847876

Musawir, A., Serra, C. E. M., Zwikael, O., & Ali, I. (2017). Project governance, benefit management, and project success: Towards a framework for supporting organizational strategy implementation. *International Journal of Project Management*, *35*, 1658–1672. https://doi.org/10.1016/j.ijproman.2017.07.007

Orji, C. I. (2019). Digital business transformation: Towards an integrated capability framework

for digitization and business value generation. *Journal of Global Business & Technology*, *15*(1), 47–57. Retrieved from: http://gbata.org/ journal-of-global-business-and-technology-jgbat/

Pellegrinelli, S., & Garagna, L. (2009). Towards a conceptualisation of PMOs as agents and subjects of change and renewal. *International Journal of Project Management*, *27*, 649–656. https://doi.org/10.1016/j.ijproman.2008.12.001

Pramanik, H. S., Kirtania, M., & Pani, A. K. (2019). Essence of digital transformation: Manifestations at large financial institutions from North America. *Future Generation Computer Systems*, *95*, 323–343. https://doi.org/10.1016/j.future.2018.12.003

Project Management Institute. (2013). *Organizational project management maturity model (OPM3®)* (Third edition). Newtown Square, PA: Author. Retrieved from https://www.pmi.org/pmbok-guide-standards/foundational/organizational-pm-maturity-model-opm3-third-edition

Project Management Institute. (2016). *Governance of portfolios, programs, and projects: A practice guide.* Retrieved from https://www.ebscohost.com/ebooks

Project Management Institute. (2017). *A guide to the project management body of knowledge* (Sixth Edition). Newtown Square, PA; Author.

Project Management Institute. (2018a). *Pulse of the profession: Success in disruptive times*. Retrieved from https://www.pmi.org/learning/thought-leadership/pulse/ pulse-of-the-profession-2018

Project Management Institute. (2018b). *The standard for organizational project management (OPM)*. Newtown Square, PA: Author. Retrieved from https://www.pmi.org/ pmbok-guide-standards/foundational/organizational-project-management

Project Management Institute. (2018c). *Benefits realization management: A practice guide*. Retrieved from https://www.pmi.org/pmbok-guide-standards/practice-guides/benefits-realization

Project Management Institute. (2019). *Pulse of the profession: AI @ work: New projects, new thinking*. Retrieved from https://www.pmi.org/learning/thought-leadership/pulse/ai-at-work-new-projects-new-thinking

Raschke, C. (2018). Digital transformation through product and project innovation management. *PM World Journal*, *7*(7), 1–11. Retrieved from https://pmworldjournal.com/

Riis, E., Hellström, M. M., & Wikström, K. (2019). Governance of projects: Generating value by linking projects with their permanent organisation. *International Journal of Project Management*, *37*, 652–667. https://doi.org/10.1016/j.ijproman.2019.01.00

Romero, A., Paré, M., & Khemici, N. (2017). The hot potato game: Roles and responsibilities for realizing IT project benefits. *Journal of Modern Project Management*, *5*(2), 72–79. Retrieved from https://www.journalmodernpm.com

Sánchez, M. A., & Zuntini, J. I. (2018). Organizational readiness for the digital transformation: A case study research. *Revista Gestão & Tecnologia*, *18*(2), 70–99. Retrieved from http://revistagt.fpl.edu.br/get

Sandhu, M. A., Al Ameri, T. Z., & Wikström, K. (2019). Benchmarking the strategic roles of the project management office (PMO) when developing business ecosystems. *Benchmarking: An International Journal*, *26*, 452–469. https://doi.org/10.1108/BIJ-03-2018-0058

Senyo, P. K., Liu, K., & Effah, J. (2019). Digital business ecosystem: Literature review and a

framework for future research. *International Journal of Information Management*, *47*, 52–64. https://doi.org/10.1016/j.ijinfomgt.2019.01.002

Sergeeva, N., & Trifilova, A. (2018). The role of storytelling in the innovation process. *Creativity and Innovation Management*, *27*, 489-498. https://doi.org/10.1111/caim.12295

Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research*, *104*, 450-460. https://doi.org/10.1016/j.jbusres.2019.02.012

Sousa, M. J., & Rocha, Á. (2019). Digital learning: Developing skills for digital transformation of organizations. *Future Generation Computer Systems*, *91*, 327–334. https://doi.org/10.1016/j.future.2018.08.048

Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing digital innovation in incumbent firms: How Volvo cars managed competing concerns. *MIS Quarterly*, *41*, 239–254. https://doi.org/10.25300%2Fmisq%2F2017%2F41.1.12

Svejvig, P., Geraldi, J., & Grex, S. (2019). Accelerating time to impact: Deconstructing practices to achieve project value. *International Journal of Project Management*, *37*, 784–801. https://doi.org/10.1016/j.ijproman.2018.12.003

Szalay, I., Kovács, Á., & Sebestyén, Z. (2017). Integrated framework for project management office evaluation. *Procedia Engineering, 196*, 578–584. https://doi.org/10.1016/j.proeng.2017.08.033

Teece, D. J. (2007). Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*, *28*, 1319–1350. https://doi.org/10.1002/smj.640

Tekic, Z., & Koroteev, D. (2019). From disruptively digital to proudly analog: A holistic typology of digital transformation strategies. *Business Horizons*, *62*, 683-393. https://doi.org/10.1016/j.bushor.2019.07.002

Terlizzi, M. A., Albertin, A. L., & de Moraes, H. R. de O. C. (2017). IT benefits management in financial institutions: Practices and barriers. *International Journal of Project Management*, *35*, 763–782. https://doi.org/10.1016/j.ijproman.2017.03.006

Tshuma, B., Steyn, H., & van Waveren, C. (2018). The role played by PMOs in the transfer of knowledge between projects: A conceptual framework. *South African Journal of Industrial Engineering*, *29*(2), 127–140. https://doi.org/10.7166/29-2-1966

van der Linde, J., & Steyn, H. (2016). The effect of a project management office on project and organisational performance: A case study. *South African Journal of Industrial Engineering*, *27*(1), 151–161. https://doi.org/10.7166/27-1-1114

Walker, D., & Lloyd-Walker, B. (2019). The future of the management of projects in the 2030s. *International Journal of Managing Projects in Business*, *12*, 242–266. https://doi.org/10.1108/IJMPB-02-2018-0034

Wang, H., Pan, Y., & Luo, X. (2019). Integration of BIM and GIS in sustainable built environment: A review and bibliometric analysis. *Automation in Construction*, *103*, 41–52. https://doi.org/10.1016/j.autcon.2019.03.005

Warner, K. S. R., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning, 52*, 326–349. https://doi.org/10.1016/j.lrp.2018.12.001

Witschel, D., Döhla, A., Kaiser, M., Voigt, K.I., & Pfletschinger, T. (2019). Riding on the wave

of digitization: Insights how and under what settings dynamic capabilities facilitate digital-driven business model change. *Zeitschrift Für Betriebswirtschaft*, *89*(8/9), 1023. https://doi.org/10.1007/s11573-019-00950-5

Whyte, J. (2019). How digital information transforms project delivery models. *Project Management Journal*, *50*, 177–194. https://doi.org/10.1177/8756972818823304

Whyte, J., Stasis, A., & Lindkvist, C. (2016). Managing change in the delivery of complex projects: Configuration management, asset information and 'big data.' *International Journal of Project Management*, *34*, 339–351. https://doi.org/10.1016/j.ijproman.2015.02.006

Zaki, M. (2019). Digital transformation: harnessing digital technologies for the next generation of services. *Journal of Services Marketing*, *33*, 429–435. https://doi.org/10.1108/JSM-01-2019-0034

Zwikael, O., Meredith, J. R., & Smyrk, J. (2019). The responsibilities of the project owner in benefits realization. *International Journal of Operations & Production Management*, *39*, 503–524. https://doi.org/10.1108/IJOPM-02-2018-0086