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A Practical Guide to Digital Transformation

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Patterns of Digitization

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The Patterns of Digitization survey highlights how companies implement digital transformation and how digitally mature and digitally developing companies differ.

Paul Mugge, Haroon Abbu, Timothy L. Michaelis, Alexander Kwiatkowski, and Gerhard Gudergan

OVERVIEW: Digital transformation is reshaping entire segments and industries: communications, retail, and, increasingly, health care, medicine, agriculture, and manufacturing. While a few companies reach front-runner status, most seem to lag. Digital transformation is a top concern of senior leaders worldwide and motivated the development of this study. This article describes the results of the Patterns of Digitization survey designed to assess how companies are implementing digital transformation. The survey covers the various strategies companies employ, the technologies they invest in, and, in particular, the actions they take to overcome the organizational resistance that is common in most large-scale transformations. We highlight important actions all companies are taking to digitally transform their businesses and the differentiated actions of digitally mature organizations. The insights gleaned from the study should help lagging companies understand what is involved in implementing a digital transformation and what they need to do to catch up.

KEYWORDS: Digital transformation, Innovation management, Business model, Corporate culture, Change management

Nambisan et al. (2017, p. 224) characterize digital transformation as "the creation of, and consequent change in, market offerings, business processes, or models that result from the use of digital technology." Digital transformation is forcing companies to rethink the role and value that data have in their business models (Brownlow et al. 2015). In most instances, digital transformation requires a fundamental change in the organization's underlying mindset, systems, and tools to reposition parts of, or the entire, organization (Gupta 2018). As a result, multiple frameworks and sets of definitions have been proposed (Vial 2019), suggesting a consensus that digital transformation represents a significant change in the basic pattern of how organizations create value.

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Digital transformation has gained significant attention in consulting publications and management journals (Sheng, Amankwah-Amoah, and Wang 2017), illustrating a profound interest—if not an outright economic need—to better define, understand, and manage digital transformation. Despite the promise of creating new and productive business designs that profitably leverage the explosion occurring in communications and computing technologies, many organizations exhibit a "wait and see" attitude to digital transformation. While a few companies have achieved front-runner status, most lag behind (Westerman, Bonnet, and McAfee 2014). At best, the digital transformation activities of these organizations can be labeled experiments or proof of concepts. Senior managers worry that their organizations may not have the knowledge, tools, or the will to undergo a change of this magnitude.

The Fears of Senior Management

Each year the Enterprise Risk Management (ERM) Initiative of the Poole College of Management at North Carolina State University collaborates with global consulting firm Protiviti to assess the top risks facing organizations. In a 2018 survey, Executive Perspectives for Top Risks in 2018, Protiviti interviewed 728 members of the top management teams representing industries from around the world. Sixty-seven percent of respondents rated the "rapid speed of disruptive innovation" as the top strategic threat to their organizations (NC State ERM Initiative and Protiviti 2017). These organizations are concerned that new technologies will outpace their ability to keep up or remain competitive. With the advent of new digital technologies and rapidly changing business models, these companies worry whether their present organizations are agile enough to respond to new customer expectations that may change their core business model.

Respondents also identified their organizations' overall resistance to change as their top operational risk. They are increasingly concerned about their organizations' unwillingness to change business models and alter core operations in response to changes in the business environment or industry. In recent years, companies have learned that mistakes in the digital economy can be lethal. For example, Blockbuster once controlled the majority share of the movie rental business but failed to adapt its business model to account for digital platforms like Netflix, which resulted in Blockbuster declaring bankruptcy in 2010 (Chopra and Veeraiyan 2017). History has shown that as business model disruptors emerge, companies need to adapt and make timely changes to remain competitive.

Since 2015, organizational culture has been a chief concern of industry leaders and a top-ten enterprise risk according to the Protiviti survey. To demonstrate this sentiment, one executive stated, "Culture may not encourage the timely escalation of risk issues" (NC State ERM Initiative and Protiviti 2017, p.14). A poor culture, combined with resistance to change, can be detrimental for organization leaders if they become out of touch with business realties. Storey and Song (2017) emphasize that implementing a data-driven culture is one of the biggest challenges in digitally transforming one's business model. This sentiment is echoed in other business surveys, including a large one conducted by Goran, LaBerge, and Srinivasan (2018), in which the need for culture change and associated behavioral changes were identified as the main obstacle to digital effectiveness.

ERM and Protiviti researchers concluded that the question is not "if" digital is going to upend their current business model, but "when." Even when executives are aware of emerging technologies that obviously have disruptive potential, they struggle to envision or anticipate the nature and extent of change. Overcoming these hurdles represents the major challenges leadership teams confront when digitizing their businesses. As Westerman, Bonnet, and McAfee (2014, p.5) observe, "The innovations and disruptions of the past ten years have been nothing short of astonishing, but they're just the warm-up acts for what's to come." The trend towards digital transformation is only going to get stronger and predominant. McAfee and colleagues (2012) found that data-driven companies are on average 5 percent more productive and 6 percent more profitable than other competitors in the market are. Digital masters, which are characterized by visionary management and digital capabilities, are 26 percent more profitable compared to their competitors. Furthermore, digitally mature companies generate 9 percent higher revenue from their physical assets (Westerman, Bonnet, and McAfee 2014).

Study and Survey Development

The current study is intended for practitioners, specifically, the senior and middle management of organizations that are currently implementing digital transformation.[1] Our objective is to help these organizations succeed by sharing with them how other companies are approaching the task. With the help of our academic and industry partners, we designed and tested a survey instrument, labeled Patters of Digitization, to assess how companies are implementing digital transformation, including the various strategies they employ, the investments they make, and the actions they take to achieve large-scale (institutionalized) digital transformations.

The Business Transformation Framework (Gudergan and Buschmeyer 2015), which served as the theoretical basis for the Patterns of Digitization survey, describes the major issues of a business transformation and calls out how the effectiveness, efficiency, and sustainability of the new business model is ensured. For example, an organization can apply the Business Transformation Framework to help break down the process of business transformation into four main areas to manage: transformation strategy, transformation design, transformation delivery, and governance and leadership (Gudergan and Buschmeyer 2015). Addressing each component of the framework provides the scaffolding necessary to sustain new business transformation initiatives like digital transformation.

Transformation strategy establishes the foundations for success and defines the strategic initiatives needed to attain the company's future purpose. Transformation design defines

[1]This survey is available upon request for organizations interested in assessing their own level of digital maturity.

the future business system, the new organizational characteristics and work patterns needed to support it, and the specific design activities needed to implement them. Transformation delivery addresses the mindset and organizational culture companies need to adopt, so they can implement the criteria established in transformation design. Governance and leadership play an important role in that business leaders must provide guidance along the transformation journey, communicate the vision across the organization, and attempt to reduce employee resistance, which frequently occurs in organizations asked to adopt a new strategy and culture simultaneously (Gudergan and Buschmeyer 2015).

Industry partners engaged in digital transformation helped develop and vet the research model and research questions. The research model assumes a top-down, senior management–led, holistic transformation approach. Based on our observations, we recommend this type of approach to accelerate the performance of organizations that lag behind competitors in digital transformation. Digital transformation experts also emphasize that "The only effective way we've seen to drive transformation is top-down, through strong senior executive direction coupled with methods that engage workers in making the change happen" (Westerman, Bonnet, and McAfee 2014, p.6).

Digitally Mature vs. Digitally Developing Organizations

For this study we distinguished between "digitally mature" and "digitally developing" organizations. Our definition of digital maturity is based on the Carnegie Maturity Model Integration (CMMI) process. *CIO Magazine* describes CMMI as a "process and behavioral model that helps organizations streamline process improvement and encourage productive, efficient behaviors that decrease risks in software, product and service development" (White 2018). The CMMI model breaks organizational maturity into five levels. For businesses that embrace CMMI, the goal is to raise the organization to Level 5, the "optimizing" maturity level. CMMI considers organizations that achieve Levels 4 and 5 as high maturity—these organizations are "continuously evolving, adapting and growing to meet the needs of stakeholders and customers" (White 2018) (Figure 1). We use CMMI to classify companies into digitally mature and digitally developing categories. We classified companies at Levels 4 and 5 as highly mature organizations and labeled them *digitally mature* organizations. Companies operating at Levels 1, 2, and 3 we designated less mature and labeled them *digitally developing* organizations.

Using the CMMI process, the literature on digital transformation, and the direct feedback from practitioners, we developed the following definitions for each level of digital transformation maturity in an organization:

1. Level 5 is the optimized state. Companies operating at Level 5 have achieved digital maturity and are primarily concerned with the continuous improvement of the new business model and business processes.
2. Level 4 is the level where synergies occur; the company involves competencies and people from outside the organization.

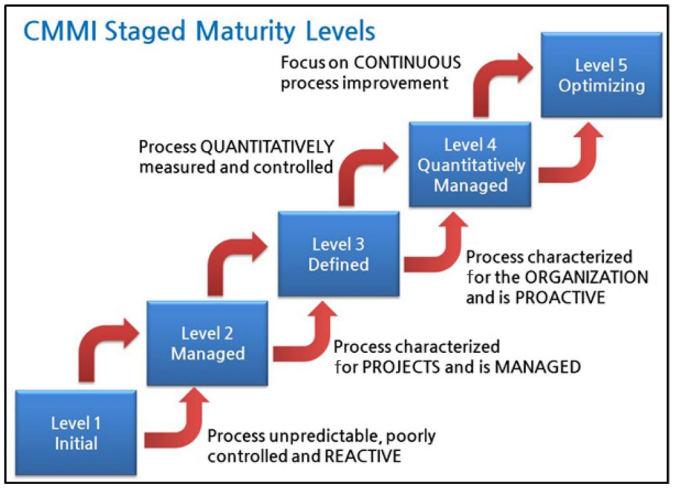

FIGURE 1. Capability Maturity Model Integration (CMMI) maturity levels

3. Level 3 is where managers' actions reflect the new, desired behaviors; their goal is to institutionalize the new model.
4. Level 2 is where organizations make digitization a strategic imperative, and a transformation strategy is developed.
5. Level 1 is the initial state, with no concerted efforts on digitization.

The separation of digitally mature and digitally maturing classification occurs between Level 4 and Level 3. Level 4 companies have had to involve competencies and people from outside the organization to achieve the external initiation strategies, for example, developing an ecosystem, entering into a merger and acquisition, or creating a digital spinoff. By contrast, Level 3 organizations typically concern themselves with improving project performance with the goal to institutionalize the new model. In our observation, this last step of institutionalization may be the hardest task of all, and that is where most digitally developing organizations find themselves today.

The companies used the survey, based upon our definitions, to classify where they are with digital transformation. We gathered data from 559 decision makers (middle and senior managers) across five geographic regions—America, Europe, Asia, Africa, and Oceania. The survey has the following sections: company characteristics, digital transformation process (initiation

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TABLE 1. Sample characteristics

Industry Sector	Firm Size (no. of employees)						
	1–9	10–199	200–1,000	>1,000	Unspecified	Total	%
IT/Communications	9	15	28	58		110	19.7%
Consulting/Services	33	20	15	16		84	15.0%
Other	25	12	13	12		62	11.1%
Education	6	6	12	16		40	7.2%
Construction/Real Estate	5	11	13	7		36	6.4%
Finance/Insurance	1	7	14	13		35	6.3%
Unspecified	8	3	4	3	13	31	5.5%
Retail/Wholesale	9	5	11	5		30	5.4%
Health Care	4	6	6	8		24	4.3%
Manufacturing	2	2	9	11		24	4.3%
Automotive and Suppliers	3	2	3	9		17	3.0%
Mechanical/Engineering		3	5	8		16	2.9%
Agriculture/Agribusiness/ Bioscience	4	3	1	4		12	2.1%
Transport/Logistics	1		4	6		11	2.0%
Chemicals/Pharma		1		7		8	1.4%
Energy/Gas	2		2	4		8	1.4%
Government			3	5		8	1.4%
Industrial Waste			1	1		2	0.4%
Public Administration			1			1	0.2%
Total	**112**	**96**	**145**	**193**	**13**	**559**	
	20.0%	**17.2%**	**25.9%**	**34.5%**	**2.3%**	**100.0%**	

strategy, design strategy, design philosophies, communication, leadership), functional unit characteristics, and enabling technology. The questions focus on important issues confronting organizations engaged in a digital transformation. The findings provided a reasonable account of the investments made, technologies deployed, and the experience organizations have in initiating, designing, and scaling their digital businesses.

In the Company Characteristics section, we asked respondents a number of standard demographic questions, including the region and industry sector their company operates in, and their company's size, age, and number of employees (Table 1). We also asked participants to rate the digital maturity of their organizations on a 5-point scale, from Level 1 *ad hoc* ("no formal plan or approach") to Level 5 *optimum* ("new business model is fully internalized; results are repeatable and predictable") (Figure 2).

In the Digital Transformation Process section, we asked respondents which initiation strategies (that is, actions they take to develop digital capabilities—for example, mergers and acquisitions) their companies had chosen to execute. We asked respondents if they had personal experience with the initiation strategy and how they rated its success. Where participants indicated they had experience with a particular strategy, we asked them to rate the relevance of the company's associated design strategy to make sure we had *bona fide* practitioner data in the survey. We also asked respondents to assess the design philosophy, digital leadership, and communication practices their organizations had employed to build their digital businesses. Those components address the softer factors of digital transformation and organizational change and are important to understand.

In the Functional Unit Characteristics section, we asked questions to understand the impacts of the digital transformation process at the department level and to gauge whether the practices of digital transformation are internalized and institutionalized. In the Enabling Technology section, we asked respondents to identify the technologies their organizations use to deploy digital transformation (Figure 3).

Assessing the Practices of Digitally Mature Organizations

To understand how the practices of digitally mature companies differ from digitally developing ones, we examined their

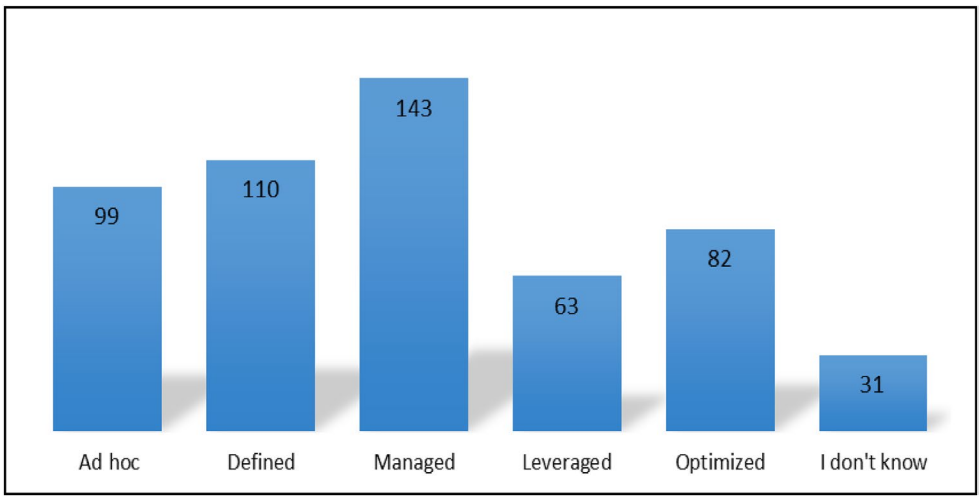


FIGURE 2. Digital maturity ratings

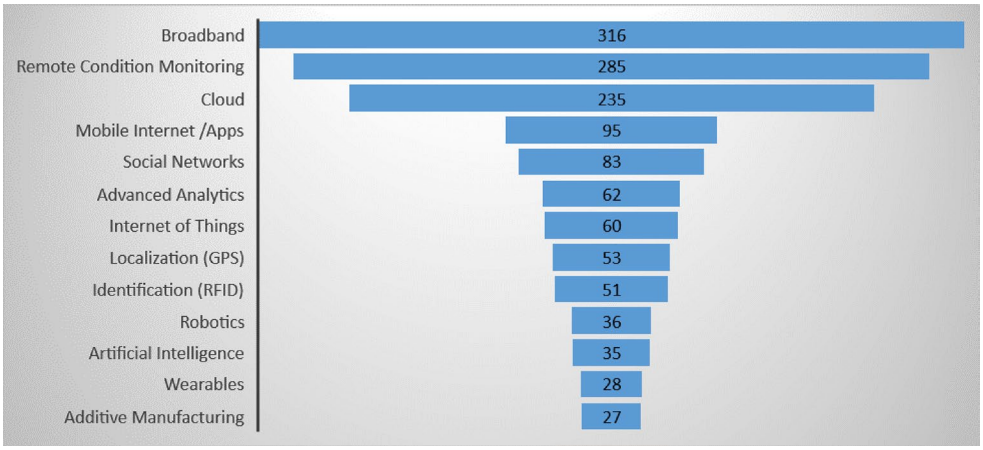


FIGURE 3. Enabling technology investments

key investments, key investment focus, success of their initiation strategies, design philosophy, digital leadership, communications, and functional unit characteristics. The value of examining the first three activities (key investments, key investment focus, and success of their initiation strategies) is obvious as this is how organizations primarily position themselves as digital businesses. Examining the next three activities (design philosophy, digital leadership, and communications) is perhaps less obvious, but equally important, as they show how senior management steps up to cultural impediments and overcomes their top operational challenge—the organization's resistance to change. As we have pointed out, cultural factors can have a large influence on how new business models are developed and evolve within an organization. In fact, the CEO of Microsoft, Satya Nadella, points out the impact of culture on digital transformation: "Culture change is not an abstraction; it is really walking the walk" (Nadella and Euchner 2018, p. 13).

Examining the impact these activities are having on the characteristics of functional units is the ultimate test of a digital transformation. Until these actions are adopted at the department level—in other words, internalized—the transformation is not complete. For companies undergoing digital transformation, high levels of internalization (that is, organization-wide commitment to a practice) have been shown to complement and strengthen the relationship between a practice's implementation and its success (Abbu and Gopalakrishna 2019).

A Practical Guide for Digital Transformation

Our sample yielded 352 digitally developing organizations with a maturity range between Level 1 and Level 3, and 145 digitally mature organizations with a maturity range of Level 4 or 5. We used multiple statistical tests to identify differences between digitally developing and digitally mature organizations. We first selected those results where there was an observable difference in the mean results and where the standard deviation was low (meaning there was a low variance in the data points around the mean). We conducted multiple t-tests, with a Bonferroni correction to control for the family-wise error rate regarding multiple comparisons (Goeman and Solari 2014) to ensure the difference in the mean results was not due to inflated error from multiple tests. In addition, we calculated Cohen's d, a measure of effect size to rank order and directly compare the mean differences between the groups (Cohen 1988). Essentially, an effect size is interpreted as the distance between two mean values that have been standardized assuming a normal distribution. A medium (that is, $.20 < d < .50$) or large effect (that is, $d > .50$) would suggest substantial differences between digitally developing and digitally mature organizational behaviors.

Using this process, we identified 18 differences in practice attributes based on 47 performance comparisons that may distinguish the practice of digitally mature organizations from those of digitally developing organizations. We synthesized these findings as six key themes that, taken together, provide a practical guide for organizations engaged in digital transformation.

1. Align your resources, both financial and human, with your strategy.

Digitally mature organizations align resources with their strategy. Both digitally mature and digitally developing organizations invest in new technologies, new businesses, staff such as data scientists, and move their products and services to the cloud; companies that are not digitally mature struggle with where and how to invest their resources. Digitally mature organizations are investing in new technologies to build new businesses; they are not simply automating current business processes. Appointing a chief data officer (CDO) was one of the least likely actions taken overall, but our respondents indicated it is vital for a digitally mature organization, as are hiring or training data scientists and moving products and services to the cloud. Our study results indicated digitally mature companies were slightly more likely to hire or train data scientists

For companies undergoing digital transformation, high levels of internalization have been shown to complement and strengthen the relationship between a practice's implementation and its success.

Digitally mature leaders are knowledgeable, exhibit entrepreneurial behaviors, and promote digital transformation.

(M = 1.36, SD = .40, $t(557) = 4.09$, $p < .001$, d = .38), appoint a chief data officer (M = 1.28, SD = .45, $t(557) = 4.08$, $p < .001$, d = .37), and move their products and services into the cloud (M = 1.50, SD = .50, $t(557) = 4.09$, $p < .001$, d = .36). Similarly, we found that digitally mature companies were much more likely to invest in new technologies to build up new businesses (M = 1.73, SD = .45, $t(557) = 5.60$, $p < .001$, d = .56).

Resource allocation is a central management activity. No achievement of strategic objectives is possible without the proper allocation of scarce resources. The relationship between resources and strategy is a two-way street. Strategy affects resources and resources affect strategy. Yet in many cases, the process is subject to personal and political preferences. Consequently, strategy formulation and implementation activities are deferred.

Today's problems soak up available energies and resources. Scrambled accounts and budgets fail to reveal the shift away from strategic needs to current squeaking wheels. Senior management should not let this happen—employees will see right through it.

2. Engage key partners and develop externally focused business plans.

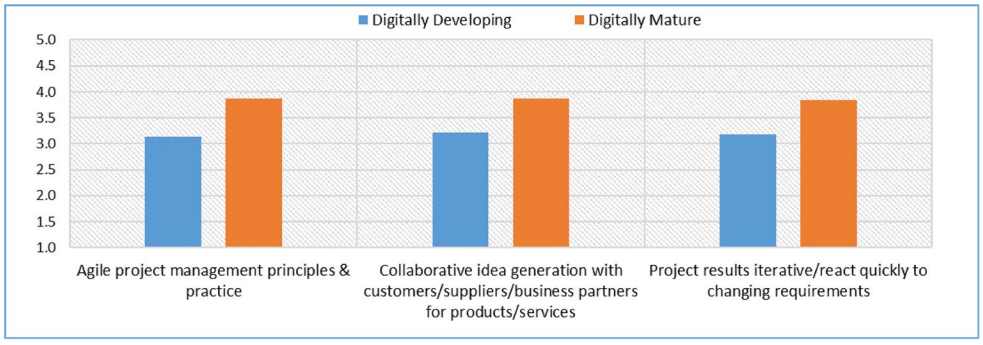
Digitally mature organizations succeed with externally oriented strategies. In all cases, these strategies integrated competencies from outside the organization. Digitally mature organizations realize that if they want to create truly breakthrough digital offerings, they will need breakthrough business models that include key partners (suppliers, distributors, customers, even other developers) from outside the boundaries of the enterprise. Developing a breakthrough business model with external partners is by far one of the hardest things for established firms to learn and do. For digitally developing organizations, these statistically relevant insights regarding which initiation strategy to pursue could be very informative. Specifically, our results indicated that digitally mature companies were much more likely to successfully engage in outside-in (external) mergers and acquisitions (M = 4.1, SD = .85, $t(357) = 6.32$, $p < .001$, d = .76), have core competencies in developing digital joint ventures (M = 3.88, SD = 1.09, $t(326) = 4.82$, $p < .001$, d = .59), and much more likely to launch digital spin-off companies from inside their organization to outside their organization (M = 3.99, SD = 0.98, $t(337) = 4.74$, $p < .001$, d = .58).

3. Demand collaboration and a nimble development environment.

Digitally mature organizations must support a nimble and collaborative development approach if they are to be seen as innovative and responsive to the accelerating change in customer needs. Design philosophies are the formal and informal guidelines for how new products, services, processes, and even business models are developed and evolved within an organization. Design philosophies can have a great bearing on how digitization strategies are implemented and, important to our focus, the overall success and speed of the digital transformation. Digitally mature organizations excel at these practices. Our results indicated that digitally mature organizations were much more likely to support Agile principles; transparent and open communication about digital projects (M = 3.88, SD = .98, $t(418) = 5.66$, $p < .001$, d = .64); much more likely to generate new ideas from communication with clients, suppliers, and business partners (M = 3.86, SD = 1.03, $t(421) = 5.26$, $p < .001$, d = .58); and much more likely to have shorter project times that were iterative based upon the market environment (M = 3.84, SD = 1.03, $t(418) = 5.10$, $p < .001$, d = .57) (Figure 4).

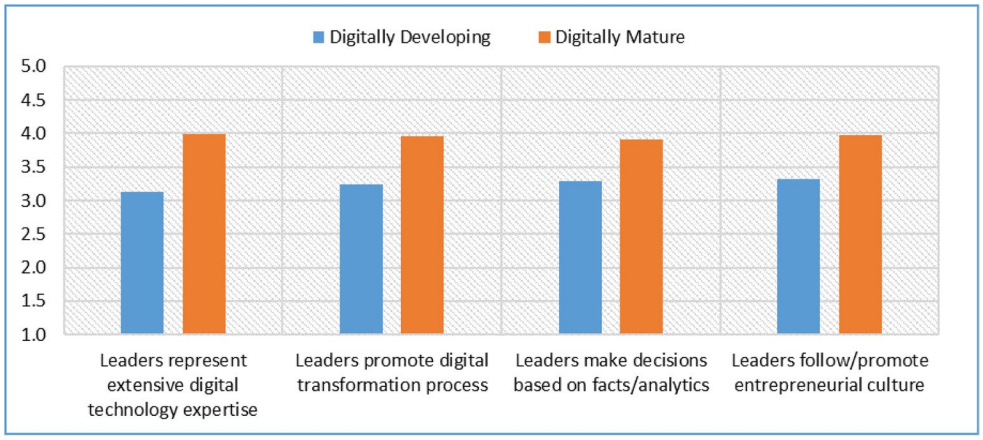
4. Acquire entrepreneurial leaders.

Digitally mature leaders are knowledgeable, exhibit entrepreneurial behaviors, and promote digital transformation. The behaviors of executives and leaders directly impact on employee performance and therefore affect the implementation of digital transformation strategies. Changes of this magnitude are often destined to fail or stagnate without notable support from an organization's leadership (Kane et al. 2017). According to our results, digitally mature companies were much more likely to have leaders with extensive technological expertise (M = 3.99, SD = 1.06, $t(418) = 6.65$, $p < .001$, d = .74), actively promote digital transformation (M = 3.95, SD = 1.02, $t(415) = 5.78$, $p < .001$, d = .64); make decisions less from



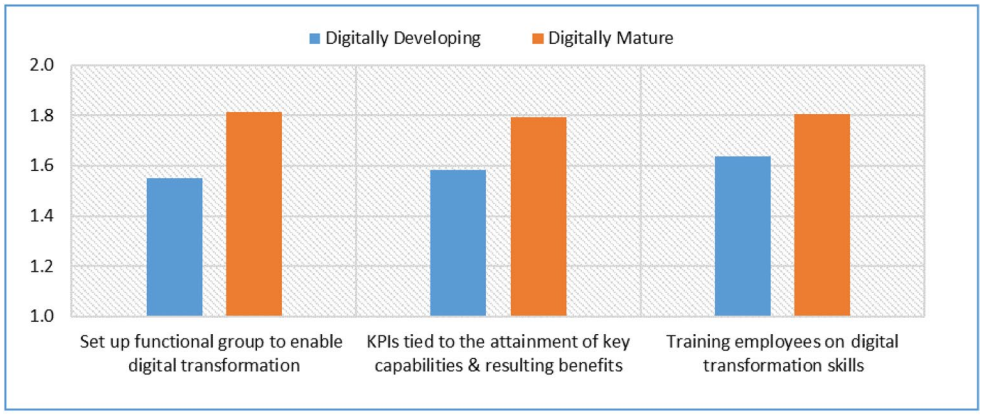
Mean value comparison of the 2 groups on 3 actions (1 = never, 5 = 100% of the time)

FIGURE 4. Design philosophies



Mean value comparison of 2 groups on 4 actions (1 = Never, 5 = 100% of the time)

FIGURE 5. Digital leadership



Mean value comparison of the 2 groups on 3 actions (1 = No, 2 = Yes)

FIGURE 6. Functional unit characteristic

intuition and more based from data and facts (M = 3.91, SD = 0.99, $t(417) = 3.67$, $p < .001$, d = .59); and demonstrate an entrepreneurial mindset to employees (M = 3.98, SD = 1.01, $t(419) = 5.31$, $p < .001$, d = .59) (Figure 5).

5. Insist that leaders "communicate, communicate, communicate."

The vision for digital transformation needs to be communicated across the organization. Communication is the fourth step in Kotter's (1996) eight-step change management process. Once a vision for change is created, leaders need to communicate the message frequently and powerfully. The message about digital transformation will likely compete with other day-to-day communications, so it needs to be embedded in everything leaders do. Finally, yet equally important, the vision should permeate all aspects of operations—from training to performance reviews.

Digital leaders foster timely and open communications. Communications are the formal and informal rules and behaviors of how information is exchanged between individuals and/or organizations. Communications greatly influence the success and speed of digital transformation within a firm (West Communications 2016). There is a sizeable disparity between digitally mature and digitally developing organizations in their level of open communication. Specifically, our results show that digitally mature organizations have higher amounts of transparent and open communication across their organization (M = 4.16, SD = 0.97, $t(425) = 5.37$, $p < .001$, d = .59).

6. Support the efforts of your departments and train employees.

Make extra effort to support each department—not just the mainline functions of R&D, operations, customer service—including corporate training, sales support, and IP law. Ensure each department's goals are tied to the attainment of its digital capabilities and to the organization's overall goals. And, of course, invest in training for employees (Michaelis and Markham 2017). Not everyone can be replaced—these trained people will likely determine the bulk of the organization's transformation success. Digitally mature companies make a concerted effort to invest in training to give employees the skills necessary to thrive in the digital economy. Compared to digitally developing organizations, digitally mature organizations give significant attention to measuring the benefits of digital transformation. Our results show that digitally mature organizations are much more likely to create functional groups for the express purpose of enabling digital transformation (M = 1.81, SD = 0.39, $t(408) = 5.19$, $p < .001$, d = .59), are slightly more likely to tie the organizations key performance indicators (KPIs) to align with trainings for employees (M = 1.81, SD = 0.41, $t(387) = 4.06$, $p < .001$, d = .47), and are slightly more likely to engage employees in trainings oriented toward digital transformation initiatives (M = 1.81, SD = 0.40, $t(409) = 3.43$, $p < .001$, d = .38) (Figure 6).

Conclusion

Digital transformation can generate substantial economic benefits. Digital maturity is achieved through commitment, investment, and leadership. Digitally mature companies set realistic priorities and commit to the hard work of making digital maturity happen. Leaders need to realize that maturation is a natural process, but it will not happen automatically. Digital maturity entails learning how to respond

appropriately to the emerging digital competitive environment. Achieving digital maturity is not instinctual for organizations, leaders, or employees. The specific lists of differentiated practices identified in this study should give management a work plan as they embark on their digital transformation journey and achieve digital maturity. To appreciate the real ROI, consider the "do nothing" examples that stand out as reminders of what can happen. Blockbuster or Netflix: which is the better alternative?

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