Enabling Digital Transformation: An Analysis Framework

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Abstract

Drawing on empirical evidence on the differentiators of organisational digital maturity and the literature on organisational change and performance, we explore firm characteristics and identify various organisational dimensions that are determinants of a successful digital transformation. A matched-pair design is adopted in this study to examine 129 pairs of large companies from 15 sectors that are performing digital initiatives and having either an increase or a decrease in their market value. We identified strategic, cultural and structural characteristics that distinguish companies that are experiencing positive outcomes and can be considered as digitally maturing firms.

Keywords: Digital Transformation, Digitalisation, Digital Technologies

Introduction

Embracing the opportunities offered by digitalisation is one of the main challenges and priorities for contemporary firms. The transformation of business processes to take advantage of new digital technologies, however, is a complex issue that affect all segments within a company (Hess et al., 2017), and remains poorly understood in both theory and practice (Parviainen et al., 2017; Loonan et al., 2018).

Some empirical non-academic studies have investigated the profile of digitally maturing companies (companies in which digitalisation is transforming processes, talent engagement, and business models) and indicated a range of digital capabilities related to companies' activities, people, culture and structure that are determinants of digital transformation success (e.g. Kane et al., 2015; 2017). This evidence, however, is anecdotal and generally based on a self-evaluation of firms' level of digital maturity. Empirical evidence has also suggested that managers in many industries recognise that their companies are not well-prepared for a digital transformation (Fitzgerald et al., 2013). Cases of companies that have failed in digital initiatives have been reported in the literature and media (Hess et al., 2017). According to Forbes (2016), one in eight digital transformation initiatives succeeds, and more than 50% fail completely. Moreover, cases of firms that have had their market values languish despite having invested in digital

transformation strategies have also been recognised (Davenport and Westerman, 2018). Why some companies have not achieved the expected outcomes and what are the characteristics of firms that are performing digital initiatives and experiencing a growth in their market value, however, remain scarcely explored in the literature. Indeed, there is still limited research in the academic literature investigating the characteristics of companies that are more mature, succeeding in their digital initiatives and are experiencing positive performance outcomes.

Therefore, drawing on the current empirical evidence on the differentiators of digital maturity, as well as on the literature on organisational change and organisational performance, this study attempts to shed light on the firms' characteristics and the aspects of their digital transformation initiatives that are related to a positive performance. By investigating characteristics associated with a successful digital transformation, this paper seeks to contribute to both literature and practice. Once it is critical to understand how organisations manage their digital transformation (Liu et al., 2011) and the organisational aspects involved in such transformations (Hess et al., 2017), this study provides insights for practitioners regarding the relevant dimensions of a successful transformation initiative. Moreover, academic research on digital transformation conducted from an organisational perspective remains in the early stages (Holotiuk and Beimborn, 2017; Parviainen et al., 2017; Loonan et al., 2018); therefore, this study aims to contribute to the nascent theory on the intra-organisational factors influencing the transformation process. Indeed, insights into practices and strategic actions for implementing digital transformations remain scarcely explored in the organisational change literature, and more academic research is needed (Sia et al., 2016; Holotiuk and Beimborn, 2017; Loonan et al., 2018).

The remainder of this paper is structured as follows. The next section outlines the main differentiators of digitally maturing organisations and presents the hypotheses tested in this study, followed by a description of the sample selection, data collection, and constructs measures. The results of a comparative analysis of 129 low-performing companies implementing digital initiatives and 129 competitors experiencing market value increases are then presented. Finally, conclusions are drawn regarding the main implications of the paper, its limitations and directions for further research.

Differentiators of digital maturity

Four firms' characteristics, (i.e., strategic, managerial, cultural and structural characteristics) are analysed in this paper, based on the existing empirical studies on organisational digital maturity (e.g. Kane et al., 2015, 2017) and the literature on organisational change (e.g. Romanelli and Tushman, 1994). Essentially, the selected characteristics represent some important digital transformation dimensions discussed in the literature and industry reports (e.g., Kane et al., 2015; Hess et al., 2017; Loonan et al., 2018). Digital maturity is about organisational adaptation to compete effectively in an increasingly digital environment, and it goes far beyond simply implementing new digital technologies to involve aligning an organisation's strategy, workforce, culture, technology, and structure (Kane et al., 2017).

Industrial reports have demonstrated that digitally maturing organisations perform better than less mature organisations (Westerman et al., 2012; Baculard et al., 2017). Other studies have shown that some digital transformation initiatives have not impacted a company's market value, despite the investments made (Davenport and Westerman, 2018). Thus, the assumption adopted in this study to test the hypotheses is that digitally maturing companies are those succeeding in their digital initiatives, which is reflected in performance outcomes and in the growth of their market value, and less digitally mature

companies are those that despite having implemented digital initiatives, have not achieved improved performance outcomes.

A range of studies has recognised that strategy is a great predictor of digital transformation success (Hess et al., 2017; Kane et al., 2017; Sebastian et al., 2017). Organisations in which digitalisation has transformed processes, talent engagement and business models have a clear and a coherent digital strategy (Kane et al., 2015), one that is integrated into the overall business strategy (Kane et al., 2017). Indeed, a digital strategy is more than a functional-level IT strategy; it is broader, more prominent, more embedded and more encompassing (Bharadwaj et al., 2013). Hence, we hypothesise:

H1a. Digitally maturing companies have a more integrated digital strategy than the less mature companies.

Industry reports also reveal that digitally maturing companies have a greater digital intensity; i.e., these companies invest more in technology-enabled initiatives (Westerman et al., 2012). Indeed, a valuable digital transformation strategy drives resource allocation and capital investment (Sebastian et al., 2017). The use of technologies reflects the firm''s approach and capability to explore and exploit new digital technologies, and it is a key dimension of a digital transformation strategy (Hess et al., 2017). The investment in new digital technologies to increase the digital intensity is also related to the strategic domain initiative and is a characteristic of healthy firms (D'Aveni, 1989). Accordingly, we hypothesise:

H1b. Digitally maturing companies take more domain initiative than the less mature companies.

With regard to the managerial factors, a range of studies have acknowledged the leadership's role in promoting digital transformation (Kane et al., 2015; Sawy et al., 2016). This is an essential factor because companies that embark on a digital transformation must change their management mindset (Dery et al., 2017). Empirical evidence has demonstrated that what separates digital leaders from others is a clear digital strategy combined with a culture and leadership poised to drive the transformation (Kane et al., 2015). The key skills of digital leaders are IT competence, change management and inspirational skills (Singh and Hess, 2017). Moreover, it has been recognised in the organisational performance literature that the combined capacity of the members of the top management team as well as the top management team's background influence firm performance (Carpenter, 2002). Therefore, we hypothesise:

H2. Digitally maturing companies have a higher proportion of top management team members with a background in digital, technology and innovation.

Structural changes have also been highlighted as a key dimension of every digital transformation endeavour (Hess et al., 2017). This refers to the modification of organisational structures, processes and skillsets that are necessary to exploit new digital technologies (Hess et al., 2017). Organisational structures focused on traditional control systems may hamper the agility needed to operate in a fast-paced digital market (Kane et al., 2017). Command-and-control working environments created around clearly defined managerial hierarchies work well in designing efficiency into the organisation, but they make it much harder for employees to respond rapidly to customers' demands and work more quickly and more collaboratively (Dery et al., 2017). A distributed leadership structure is thus required to increase the organisation's ability to engage in digital business successfully (Kane et al., 2015). Accordingly, we hypothesise as follows:

H3a. Digitally maturing companies have a more decentralised management structure than less mature companies.

Additionally, as part of the structural change, maturing digital organisations build the skills needed to realise the strategy and do not tolerate skills gaps (Kane et al., 2015). Hence, we hypothesise:

H3b. Digitally maturing companies invest more in skillset building than less mature companies.

Finally, industry reports have pointed out that taking risks is a cultural norm in digitally maturing companies. Indeed, a risk-taking culture supports learning, which is effective in achieving innovation (Prajogo and McDermott, 2011). Overcoming aversion to risk is recognised as one of the most important characteristics of digital transformation (Kane et al., 2017). Hence, we hypothesise:

H4. Digitally maturing companies have a stronger risk-taking culture than less digitally mature ones.

The proposed hypotheses were analysed by considering a sample of 258 large companies (129 matched pairs). Large companies were selected to compose the sample because digital transformations at large, old companies remain relatively slow (Sebastian et al., 2017). Thus, it is relevant to identify the characteristics of large firms that are conducting digital initiatives and performing well, in order to inform theory and practice. The details of sample selection are presented below.

Methods

A matched-pairs design was applied in this study. This research design is common employed when comparing aspects between firms (e.g. D'Aveni, 1989). Sample firms were selected in a two-stage process. First, we identified large firms that were implementing digital transformation initiatives. We gathered information on all large companies listed in the Compustat database (5,224 companies). The 10K-filings for all companies over a 10-year period were analysed through a content analysis to identify the firms that were conducting digital initiatives. Of the 5,224 companies, we initially selected 1,651 firms that mentioned about digital initiatives in their filings in various ways and with various frequencies. We then searched for performance information for these firms in the Compustat database, and we found information (for all years) for 1,096 firms. Then, we selected 521 firms for which there were at least ten mentions of digital in the filings over the ten-year period, which is a clear indication that a firm is implementing a digital initiative. In fact, one key assumption underlying corporate reporting content analysis studies is that the volume of disclosure signifies the relative importance of such disclosure (Jeffrey, 2000). Therefore, we analysed the volume of disclosure related to digital initiatives and selected the companies that more frequently mentioned digital technologies, digital strategy and digital transformation in their filings.

Second, in order to identify the matched pairs, we analysed the growth of the market value of the firms over a ten-year period using information taken from the Compustat database. Market- or value-based performance measures have been acknowledged as more appropriate than accounting-based measures (Venkatraman and Ramanujam, 1986). The indicator was the ten-year average growth in the market value. We followed the procedures for the measurement of other growth indicators proposed in the literature (Keats and Hitt, 1988). Using annual figures, we treated the natural logarithm (a linear transformation) of it using a time-series approach, in which the time served as the independent variable. The growth measure was the antilog of the regression slope coefficient, which resulted in a smoothed measure of the growth rate over the period. We then selected the firm with the highest growth rate for each three-digit NAICS code subsector in the sample. These are the digitally maturing companies, because we adopted the assumption, based on past empirical studies, that digitally maturing companies

perform better. To identify corresponding matched pair, we selected the firm in the same three-digit NAICS code with similar business and the highest market value decline rate, which would represent the less digitally mature ones. The number of pairs in each sector was identified based on the number of firms in the sample as well as their growth or decline in their market value. This process resulted in 129 pairs of companies from 15 sectors and thirty-four three-digit NAICS code subsectors. Manufacturing (47 pairs), information and communication technology (31 pairs), retail (25 pairs) and professional services (12 pairs) are the most representative two-digit NAICS code sectors in the sample. Indeed, these are among the most digitally advanced sectors according to the Mckinsey Industry Digitization Index (Gandhi et al., 2016). Paired t-tests (to compare the means of paired groups) were performed to test the hypotheses presented in the previous section.

Measures

Integrated digital strategy. We conducted a content analysis on Part 1 of the 10-K fillings, which described the business and strategy of each company. We assessed whether digital initiatives were explicitly described as part of the company strategy over the years and how many mentions such initiatives received in the fillings. We looked for statements regarding the use of digital technologies to improve internal operations, customer experience as part of company' strategy and new digital business models. One example is the business statement of Walmart, which demonstrates a digital transformation initiative as part of the company strategy: *"through innovation, we are striving to create a customer-centric experience that seamlessly integrates our e-commerce and retail stores in an omnichannel offering that saves time for our customers."*

Domain initiative. Two measures of domain initiative were constructed. We considered the mergers and acquisitions (M&As), as suggested in the literature (D' Aveni, 1989), as well as the investments made by firms in other tech companies, the alliances and partnerships created to build the capabilities and the infrastructure required to operationalise a digital strategy. We analysed the percentage of investments in digital in relation to all the investments made by the company, for each year from t-10 to t-3. The same approach was applied to assess the mergers and acquisitions. We gathered information from the Crunchbase database and classified the acquisitions, mergers and investments by considering the categorisation of the companies provided by the database, i.e., based on the category of the acquired company or in the category of the invested company and whether these companies' businesses were within the technological domain.

Background of the top management team. We analysed the proportion of the top management team with an appropriate background for dealing with organisational transformation. We conducted a content analysis of executives' biographies to identify the members with backgrounds in digital, technology and innovation. Information about the top management team members was gathered from the Mergent Online database.

Management structure. We measured the centralisation of the management structure via tighter supervision of the decision-making process by analysing the number of the top management team members reporting directly to the chief executive officer (CEO), following the literature (D'Aveni, 1989). We gathered this information from the Mergent Online database.

Risk-taking culture. In order to determine whether there is a risk-taking culture in a given company, we analysed the number organisations founded by ex-employees of the respective firm during analysed period. We gathered this information from the Crunchbase database. If the organisation provides an environment that encourages

experimentation and acceptance of failure, the likelihood of an employee starting a new business may increase. We used this indicator as a proxy based on the assumption in the literature that the culture of an organisation can strongly affect individuals' posture, including their risk-taking and entrepreneurial postures (Covin and Slevin, 1991).

Skillset building. In order to analyse the investment in people to build the skills needed to operationalise the digital strategy, we used the average growth in IT and technology positions in a company during the analysed period as an indicator. We gathered this information from the LinkedIn premium insights.

Results and discussion

The paired t-tests results support our first hypothesis regarding the integration of the digital strategy into the business strategy. Table 1 summarises the results. We did not find information regarding all measures for all companies; thus, the number of pairs (N) used in testing the hypotheses was reduced when information was not identified.

Table 1 – t-tests results for digitally maturing companies (D) and less mature companies (L).

Measures	Mean	N	Std. Deviation	Sig. (1 Tailed)
Integrated digital strategy (L)	4.58	124	7.770	0.0420
Integrated digital strategy (D)	6.50	124	9.562	
% Acquisitions related to digital (L)	32.5%	117	0.384	0.4264
% Acquisitions related to digital (D)	31.6%	117	0.376	
% Investments related to digital (L)	23.4%	117	0.416	0.0041
% Investments related to digital (D)	36.8%	117	0.421	
% Executives with technology/innovation background (L)	30.2%	102	0.269	0.3951
% Executives with technology/innovation background (D)	31.1%	102	0.280	
Top management team reporting to the CEO (L)	6.79	117	3.236	0.0830
Top management team reporting to the CEO (D)	7.38	117	3.162	
Division officers reporting to the CEO (L)	0.50	117	0.979	0.0108
Division officers reporting to the CEO (D)	0.85	117	1.264	
IT employee growth (L)	0.05%	120	0.086	0.0252
IT employee growth (D)	1.95%	120	0.077	
Companies founded (L)	4.41	103	9.351	0.0026
Companies founded (D)	9.34	103	15.625	

The results indicate significant differences between companies experiencing a growth in their market value in terms of the integration of the digital strategy into the overall business strategy. Indeed, digital maturing companies tend to use digital technologies to achieve strategic ends. Previous industry reports have already pointed out that in the case of these firms, business transformation is a directive of the digital strategy (Kane et al., 2015), which is reflected in the integration of the digital strategy into the business strategy. In fact, as firms become more digital and rely more heavily on information, connectivity and other digital functionalities, it is expected that the digital business strategy will become simply the business strategy (Bharadwaj et al., 2013). On the other hand, less mature companies tend to implement digital initiatives to support certain business objectives or as part of IT operational strategies, but those initiatives are not at the core of the business strategy, i.e., the IT strategy is aligned but still subordinate to the business strategy. Generally, less mature companies start from a set of isolated initiatives

but struggle to translate these initiatives into capabilities that can impact business performance (Baculard et al., 2017).

With regard to the digital intensity (domain initiative), the results support the hypothesis and demonstrate that digitally maturing companies make more investments focused on building the capabilities necessary to operationalise the digital strategy. Most of these investments are focused on strategic technology alliances to complement endogenous capabilities and enable companies to cope with complex technologies. Moreover, when digital intensity increases and digital business strategy takes hold in digitally maturing companies, scaling options tend to be based on alliances and partnerships (Bharadwaj et al., 2013). Many of the investments made by digitally maturing companies are also strategic in this sense; they are focused on scaling the business, according to the analysis of investments description. Less mature companies, on the other hand, seem to invest less in other digital firms, perhaps because the digital strategy is not necessarily integrated into the business strategy, and their digital initiatives tend to be more focused on solving specific business issues. Additionally, these companies may not necessarily have the ambition to scale with the digital strategy, and for this reason, they do not make investments aimed at this strategic end.

Apart from investments in technology through alliances and partnerships, companies can integrate innovative capabilities through mergers and acquisitions (Hagedoorn and Duyesters, 2002). The results, however, do not reveal significant differences between digitally maturing firms and less digitally mature firms in terms of the proportion of acquisitions made related to digitalisation as compared to the total of acquisitions made by the firm. What may explain the high proportion of mergers and acquisitions by digitally maturing companies, besides the high proportion of digital investments, is the fact that because these companies have their digital strategies integrated into their business strategies, they may want to absorb some of the required capabilities and take control of it, if the capabilities are related to the core business (Hagedoorn and Duyesters, 2002). Actually, firms may want to protect their interests in external relationships affecting their core business, which will constitute their main competitive strength in the future (Hagedoorn and Duyesters, 2002). The discussion of which source of capabilities is better, however, is not within the scope of this paper. Furthermore, the positive impact of M&As depends on a firm's ability to integrate the knowledge (Cloodt et al., 2006).

In addition, the results did not show significant differences in the proportion of top management members with a background in technology and innovation in digitally maturing and less mature companies. This suggests that both firms have managers with the background and skills necessary to drive a digital transformation, as recommended in the literature (Singh and Hess, 2017). How these executives orchestrate the digital transformation and how they perform various roles (e.g. entrepreneur role, digital evangelist role, and coordinator role) is what may make a difference. Moreover, in addition to having appropriate leadership, companies must have a clear digital strategy and an organisational culture that is aligned with the transformation process (Kane et al., 2015), and for this reason, simply having managers with appropriate backgrounds may not be enough if there is no organisational maturity regarding the previously mentioned dimensions (Singh and Hess, 2017). The reporting relationship between the chief digital officer or the executive responsible for the digital transformation and the digital mindset of the workforce are also highlighted as relevant in the literature (Sia et al., 2016; Singh and Hess, 2017).

With regard to the leadership structure, differences in the number of top management team members reporting directly to the chief executive officer were not significant based on the measure suggested in the literature to analyse centralisation (D'Aveni, 1989) and

data available on Mergent Online. However, we observed a higher proportion of divisional officers in digitally maturing companies, suggesting a more multi-divisional and mixed structure in those firms and suggesting more decentralisation of the innovation process. Previous empirical research has found that functional and departmental silos are one of the main barriers to a company's success in the digital age, and such silos are correlated with negative performance (Bender and Willmott, 2018). In contrast, it has been claimed in the literature that multi-divisional firms can be efficient innovators because these companies decentralise product/service development and decision-making, assigning them to the relevant divisions (Tidd, 2001). This type of structure, however, may also limit the chance to learn new competencies because firms with many divisional boundaries are associated with strategies based on capabilities-deepening instead of capabilities-broadening (Tidd, 2001). Thus, the influence of structure on digital maturity and the subsequent impact on performance require a more in-depth investigation.

The results also support H4 and confirm that there is a difference in the culture of digitally maturing companies. The number of start-ups founded by ex-employees of these companies is significantly higher than the number started by ex-employees of less mature companies. This suggest the existence of a stronger culture of risk-taking in digitally maturing companies, one focused on experimentation and failure tolerance, which may have impacted in the entrepreneurship behaviours of these employees.

Finally, previous studies have also suggested building a culture in which people feel comfortable trying things that may fail can be supported by inserting disruptive thinking and hiring from start-ups and established natives, because such individuals may be a source of innovative energy and empowerment (Bender and Willmott, 2018). The results show that there is a significant increase in new digital and IT positions in digitally maturing companies as compared to less mature ones, which may suggest that these firms have focused on building the skillset necessary to promote internal change and support the cultural change. However, in addition to identifying new potential human resources, firms should also focus on training employees in needed digital skills, creating incentive systems and providing financial resources for human resources development (Kane et al., 2015). Unfortunately, it was not possible to analyse the internal development of employees from the data available.

Conclusion

Our results confirm that firms that are performing digital initiatives and experiencing market value increases distinguish in their internal aspects and the characteristics of their digital transformation initiatives and can be thus considered as digitally maturing companies. Our findings show the relevance of having a clear digital strategy that is aligned with the business strategy, the importance of building the capabilities necessary to promote the transformation through external investments and hiring new digital talent, as well as the need to establish a risk-taking culture. Our results also suggested that it may be equally important to have executives who will promote the transformation with the appropriate background to drive the change and the way in which these executives orchestrate the transformation. The actions that are taken to create changes in the interlinked organisational dimensions are crucial.

Obviously, statistical research can capture only particular features of complex phenomena such as the one studied in this paper. Other factors may also be relevant and distinguish digitally maturing companies from others, such as the management structure, regarding which we did not find significant differences in ours results, and other managerial actions such as supporting internal skills development. These factors should also be explored in further research. We have been able, however, to improve our

understanding of some of the relevant dimensions influencing organisational transformation, which were previously suggested only by anecdotal evidence. The dimensions analysed inform managers regarding what they should address in order to conduct successful digital transformations and demonstrate that a broad change is required.

Moreover, as pointed out previously, digital transformation research has been supported mostly in practice with the emergence of numerous industry reports, but the academic literature on the subject remains in the early stages, with only a limited number of conceptual and empirical studies extant. Understanding this complex phenomenon that has challenged many organisations, however, is of paramount importance for the organisational change literature, especially due to the high number of companies that have not been able to cope with the transformational requirements of new digital technologies. Our findings provide a general framework of the relevant dimensions affecting the success of digital transformation initiatives and contribute to the calls in the literature on more research in digital transformation from the organisational perspective. More research is still needed, however, especially to identify causality between the factors and performance outcomes. The paired t-tests captured differences between firms that are performing digital initiatives and experiencing an increase or decrease in their market value over the years, but these results cannot be used to claim that specific factors or a combination of factors straightforward influence on firm performance. More quantitative research would be valuable in assessing the independent and combined effects of multiple factors. Moreover, a comparison of different digital transformation initiatives, once the literature evolves and conceptual frameworks categorising digital business models emerge, would shed a more nuanced light on the performance effects of different digital transformation strategies and the conditions under which various digital business strategies lead to improved performance outcomes.

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