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A Preliminary Literature Review of Digital Transformation Case Studies

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***Abstract*—**While struggling to succeed in today's complex market environment and provide better customer experience and services, enterprises encompass digital transformation as a means for reaching competitiveness and foster value creation. A digital transformation process consists of information technology implementation projects, as well as organizational factors such as top management support, digital transformation strategy, and organizational changes. However, to the best of our knowledge, there is little evidence about digital transformation endeavors in organizations and how they perceive it – is it only about digital technologies adoption or a true organizational shift is needed? In order to address this issue and as the first step in our research project, a literature review is conducted. The analysis included case study papers from Scopus and Web of Science databases. The following attributes are considered for classification and analysis of papers: time component; country of case origin; case industry and; digital transformation concept comprehension, i.e. focus. Research showed that organizations – public, as well as private ones, are aware of change necessity and employ digital transformation projects. Also, the changes concerning digital transformation affect both manufacturing and service-based industries. Furthermore, we discovered that organizations understand that besides technologies implementation, organizational changes must also be adopted. However, with only 29 relevant papers identified, research positioned digital transformation as an unexplored and emerging phenomenon in information systems research. The scarcity of evidence-based papers calls for further examination of this topic on cases from practice.

***Keywords*—**Digital strategy, digital technologies, digital transformation, literature review.

I. Introduction

DURING the last decade, there has been an increase in the number of companies that have been introducing the concept of digital transformation. Digital transformation comprises not only the use of new technologies (e.g. advanced analytics, machine learning, artificial intelligence applications, the Internet of Things), but also the changes of the key business elements, including strategy, business model, business processes, organizational structures and organizational culture [1]. If managed successfully, it can lead to business process optimization and an overall better organizational performance. It also triggers industry disruption by the introduction of new business models and the development of digitized products and services [2].

According to Sebastian et al. [3], the role of information technology (IT) in digital transformation is two-fold: (1) IT serves as an operational backbone that supports the key business activities/operations and (2) IT is used to develop a digital services platform that facilitates rapid development and implementation of digital innovations. Besides, digital transformation frequently involves transformations of organizational structures, management concepts and business strategies. Companies need to formulate a digital transformation strategy "that cut across other business strategies and enables the coordination, prioritization, implementation and governance of transformations owing to new technologies" [4].

In recent years, an increase of interest in finding a solution to implement digital transformation successfully is evidenced among both researchers and business experts. However, there is a lack of frameworks and guidelines for companies on how to navigate such radical changes [4], [5]. The goal of this paper is to give an overview of the literature regarding digital transformation and to analyze how it is used in practice in regard to: time component; country of case origin; case industry and; digital transformation focus.

The structure of the paper is as follows: after the introduction, the methodology used for the literature review is presented. Next, the obtained results are described in detail, followed by the paper analysis and discussion. Finally, a short conclusion with research limitations and suggestions for a future research is given.

II. Methodology and Identification of Relevant Literature

In order to fulfill the objectives of this paper, a literature review approach is adopted. The first step of a literature review concerns collection of relevant literature. For this purpose, we scanned Web of Science (WoS) and Scopus databases. To be sure that the search does not exclude possible useful findings from various fields, we did not limit the search to a specific field or index. In addition, besides journal articles, we also included conference papers as recommended source for literature reviews in Information Systems (IS) field [6]. As we seek to collect insights into past findings regarding digital transformation in organizations that can provide useful practical insights, we opted for combination of keywords "digital transformation" and "case stud*" and aimed papers published in the last decade. The search strategy was therefore

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employed as follows:

- [for WoS database] TOPIC: ("digital transformation") AND TOPIC: ("case stud*") Refined by: DOCUMENT TYPES: (ARTICLE OR PROCEEDINGS PAPER) Timespan: 2009-2018. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, BKCI-S, BKCI-SSH, ESCI, CCR-EXPANDED, IC.;
- [for Scopus database] (TITLE-ABS-KEY ("digital transformation") AND TITLE-ABS-KEY ("case stud*")) AND DOCTYPE (ar OR cp) AND PUBYEAR > 2008.

The literature search was carried out in April of 2018 and yielded 72 hits in total, from which 25 papers were identified in Wos, and 47 in Scopus. After merging the results, i.e. excluding the duplicates, 54 papers remained for further analysis. In the next step, we refined the search results. A manual scan of abstracts for relevance was enforced in which we excluded the irrelevant papers. The paper was considered relevant if it specifically addressed the phenomenon of digital transformation in organizations. For instance, if it practically reported digital transformation in terms of adoption, process or project that was undertaken. Hence, papers focusing on regulations, usage of Massive Open Online Courses (MOOC), or development of computer algorithm, which used "digital transformation" term only as an opening sentence, were excluded in this step. After this quality assessment, 31 papers were identified as relevant. Then, a process of extracting the relevant information and coding started. Throughout this activity, two more papers were excluded: one paper was excluded due to language barrier since it was written in French; and the other one due to exclusion criterion since it tested its statements not on a case study, but in a simulation software. Consequently, 29 papers (listed in Appendix by Table IV) were identified as relevant and coded, and are as such the object of examination in the following paragraph.

III. Research Results

Since the objective of this paper is to examine the current state of research on digital transformation in cases from practice and explore how organizations perceive digital transformation, several attributes are chosen for analysis. These attributes are utilized for classification of papers. Attributes include: time component (*Year*); country of case origin (*Country*); case industry (*Industry*) and; digital transformation concept comprehension i.e. focus (*Focus*) and are discussed further in the text.

Prevalence of relevant papers with respect to *Year* and with time span from 2010 to 2018 is depictured on Fig. 1. From 2010 to 2015, only one paper appears annually (with a difference of 2013 in which two papers are found). Thus, only isolated research endeavors exploring digital transformation on case studies can be identified until 2015. The situation changes in 2016 with significant increase of papers (relative increase of 88% in comparison to the previous year). This positive trend continues onto 2017. Therefore, growing trend of digital transformation case studies research in the body of literature is visible in Fig. 1 which affirms that the digital transformation is a recent and appealing topic for IS researchers. This finding is in line with the results of Reis et al. [7] who similarly reported enhancement of research on "digital transformation" over the last three years.

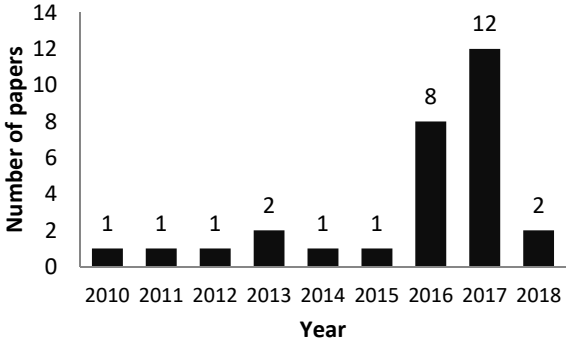

Fig. 1 The occurrence of relevant papers per publication year (n=29)

Although a reasonable mistake could be to infer that digital transformation matters only in: service industries, due to their close customer orientation; or in industries that are able to completely digitize its products, our research points out that digital transformation is not reserved for a special sector (Table I).

TABLE I
Case Studies Industry Type by NACE Rev. 2 Classification

Industry	Paper ID	Number of papers
C Manufacturing	3, 8, 15, 5, 7, 22, 1	7
J Information and Communication	2, 12, 11, 15, 22, 27	6
K Financial and Insurance Activities	18, 13, 11, 26, 27	5
G Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	13, 12, 11, 27	4
H Transportation and Storage	14, 16, 23, 4	4
M Professional, Scientific and Technical Activities	13, 11, 15, 27	4
O Public Administration and Defense; Compulsory Social Security	6, 21, 19	3
P Education	12, 28, 27	3
R Arts, Entertainment and Recreation	17, 9, 24	3
I Accommodation and Food Service Activities	14, 12	2
Q Human Health and Social Work Activities	10, 20	2
D Electricity, Gas, Steam and Air Conditioning Supply	22	1
E Water Supply; Sewerage, Waste Management and Remediation Activities	25	1
N Administrative and Support Service Activities	27	1
S Other Service Activities	29	1

When discussing industries trends, academics agree that business transformation prompted by digital technologies is visible across diverse industries. This was for instance previously noticed by Westerman et al. [8] and Henriette et al. [9]. Our paper corroborates that digital transformation occurs in public, as well as private sector, and that it is not restricted to a certain economic activity, as visible from Table I. Still, it can be observed that industries leading in case study evidence

in the body of literature by the results of our research are: manufacturing; information and communication activities and; financial and insurance activities; followed by trade and transportation activities.

In Table II, results regarding country attribute are displayed. Some of the analyzed papers used the methodology of multiple case studies, and consequently, there are papers appearing along with the multiple country names. As depictured in Table II, digital transformation is mostly acknowledged by organizations having its headquarters in Europe. U.S. and Canada take a second and a third place, followed by China and Japan. As far as Europe is concerned, we discovered precedence of evidence from Germany and Baltic countries. As also visible from Table II, we could not determine the country of case origin in 11 papers. Therefore, country results do not represent the whole sample of identified case studies. Even this is the case, our results could be valid and are understandable if we observe other available metrics related to the digital transformation and development indexes. For instance, findings regarding *Country* are consistent with the 2017 world digital competitiveness ranking [10]. Hence, we could say that developed countries and countries leading in ICT development, for which we could assume to have evolved in digital competence and comprehension of importance of digital assets, could also be the ones having digital initiatives in place.

TABLE II
CASE STUDIES COUNTRY CLASSIFICATION

Country	Paper ID	Number of papers
European countries	2, 4, 5, 6, 26, 1, 14, 15, 9, 24	10
U.S. and Canada	10, 14, 15, 14	4
China	8, 17	2
Japan	20, 29	2
Taiwan	18	1
South Africa	19	1
India	21	1
N/A	3, 7, 12, 13, 16, 22, 23, 25, 28, 27, 11	11

Our reasoning based on the *Focus* attribute is presented in Table III. Firstly, we highlighted main focal points of each papers' digital transformation narrative. After that, we were able to identify three main categories in which focal points can be placed. Therefore, organizations' comprehension of digital transformation can be distinguished by focus on: I Technology; II Strategy and; III Technology and Strategy. Organizations belonging to the third *Focus* category understand the importance of integration of different aspect of digital transformation, respectively new technology implementation; and organizational changes implemented through strategy. In some organizations, a separate digital strategy is endorsed, while others report incorporating digital transformation into overall organizational strategy. As for the focus on technology adoption, we discover that some papers reporting on digital transformation, are actually dealing with business process optimization initiated by Enterprise Resource Planning (ERP) system introduction, and other topics well studied in IS research in the last 30 years. These were placed in the I.ii subcategory. On the other hand, several organizations applied new technologies that can be described as digital technologies (I.i subcategory). These are expected, if well integrated into the organization, to generate value creation and new ways of doing business in the long run. These findings are in good agreement with Sebastian et al. [3] who recommend that all the three categories, respectively: digital strategy; operational processes backbone and; digital service platform, need to be addressed for a successful digital transformation.

TABLE III
CASE STUDIES FOCUS

Case study focus	Paper ID
I Technology	
I.i Digital technologies for new digital environment (whether in a form of: a digital IT system or; intangible system with partners and customers)	1; 14; 25; 17; 21; 24; 26
I.ii Business process computerization and reengineering, ERP system implementation	3; 7; 22; 28; 4; 6; 8; 9; 10; 18; 20; 29
II Strategy	12; 23; 5; 19
III Technology and Strategy	13; 15; 16; 27; 11; 2

IV. PAPER ANALYSIS AND DISCUSSION

Although the research on digital transformation has appeared occasionally throughout the past, we discovered the emerging trend of digital transformation case studies and noticed increased interest of scholars in the last three years for this topic. Reis and coauthors [7] reported the same trend, albeit with some differences regarding case study research. They found preponderance of case study research among methodologies for approaching digital transformation and argue that this represents the lack of theory development of the topic. Since theoretical papers are not covered by the scope of this paper, we do not feel legitimate to discuss this argument. However, we support the case study as a methodology for investigation of digital transformation, since it is an emerging topic. Researchers can have benefit from organizational examples in defining their theoretical framings (as noticed by Kruger et al. [11]), and vice versa, it still needs to be seen how academic findings about digital transformation will be utilized by practitioners. Also, the literature review conducted by Reis et al. [7] discovered somewhat higher number of case studies in the WoS database, however, this could be explained by differences in search strategy and interpretation of "case study" term.

By our findings, scholars tend to classify their papers into categories and using keywords that are not appropriate. Therefore, we consider our research to have strong validity since all the papers have been carefully inquired to match the setup research construct described in the methodology section. Besides, to the best of our knowledge, this literature review analyzed more papers than others that can be found on this topic, such as the reviews of Reis et al. [7], and Henriette and coauthors [9]; and it is the only investigating case study

papers.

Our results regarding industry diversification of digital transformation efforts corroborate previous findings [8], [9]. Despite the fact that digital transformation is extensively studied in finance industry along with the "FinTech" phenomenon [12]-[16], and in other service-based industries [17], [18], [11], we discovered the plethora of sectors under the effect of digital transformation. Moreover, the leading industry in our research has turned out to be the (heavy) manufacturing. Indeed, manufacturing industries are also facing disruption and digital innovation adoption, as was previously noticed by Liere-Netheler et al. [19] and Hanelt et al. [20]. Interestingly, Lusch and Nambisan [21] in their paper on service-based logic, drew attention to blurring the lines between tangible and intangible product industries. According to them, both industry types converge to a service orientation perspective in a process of digital transformation. However, there is a classification method that can be discussed when commenting on different sources. We followed the NACE Rev. 2 framework of European Commission for classification of economics activities which has its distinctive characteristics. For instance, tourism spans across multiple classes in the NACE framework. Hence, we placed travel agencies under the "Administrative and Support Service Activities", whereas papers that did not report specifically the sort of tourism activity were placed in "Accommodation and Food Service Activities" category. Therefore, other papers could report different findings if using another method for industry classification.

To the best of our knowledge, there are no similar scientific papers discussing cross-country state of digital transformation. However, our findings regarding country of case study origin are consistent with previous similar findings from the digital competitiveness report [10]. In comparison to this report, countries having the biggest digital competitiveness, are also the ones having lead among academic case study papers in our research. Nevertheless, a maturity of digital transformation across countries and industries is not completely clear. Consequently, it is quite possible that organizations vary extensively in digital transformation maturity.

Related to that, our inspection of *Focus* attribute reveals that organizations differ in interpretation of digital transformation. Comprehension of digital transformation process in identified papers covers a wide range of topics that can be classified in three major categories – focus on digital strategy; focus on technology implementation and; approaches combining both of the previous. Also, we discover that when focusing on technology implementation, organizations misuse digital transformation concept. They often replace it solely with business process optimization and computerization, which has been one of the major topics among IS researches since the 90s. This indicates that organizations do not fully understand how to conduct digital transformation since according to Sebastian et al. [3], an ensemble of identified focus categories and subcategories is essential for efficient digital transformation. In addition to this finding, another one regarding academic community can be identified. Investigated papers did not determine the digital readiness prior to the digital project launch; nor digital transformation maturity after the project implementation. Also, scholars do not follow common theoretical framings for describing organizations' digital transformation. Having all these considerations in mind, comparison of case study findings can be difficult. Furthermore, this indicates that there is a plenty of space for academic advancements of the field. Hence, based on this review and presented paper analysis, we summarize and propose directions for future research achievements on digital transformation. Particularly, we encourage following scientific contributions: (a) case study investigation, resulting in, or based on validated frameworks; (b) theory development and theoretical framings; (c) common definition of digital transformation, and differentiation from similar terms from related topics and; (d) empirical research that would complement case study researches, and discuss cross-country and cross-industry differences.

V. Conclusion and Future Recommendations

The results of this study show that there is still a limited number of papers exploring the implementation of digital transformation in practice. Therefore, the literature review analysis has enabled us to shed light on the comprehension of digital transformation in organizations; advise practitioners to address all of the identified transformation concepts; and identify useful research guidelines for future academic endeavors.

Still, there are limitations of this research that have to be taken into consideration. The main limitations could be the one related to the methodology. Although we searched papers in two databases common for IS research dissemination, we could not examine all of the body of literature.

In the end, we encourage future research endeavors on digital maturity, as they could provide valuable insights for practitioners and encourage new academic investigations and findings.

APPENDIX

TABLE IV
LIST OF RELEVANT PAPERS

Paper ID	Paper Reference
1	V. Arribas and J. A. Alfaro, "3D technology in fashion: from concept to consumer," *JOURNAL OF FASHION MARKETING AND MANAGEMENT*, vol. 22, no. 2, pp. 240–251, 2018.
2	J. Barland, "Innovation of new revenue streams in digital media: Journalism as customer relationship," *NORDICOM REVIEW*, vol. 34, no. SPEC. ISSUE, pp. 99–112, 2013.
3	A. Biahmou, C. Emmer, A. Pfouga, and J. Stjepandic, "Digital Master as an Enabler for Industry 4.0," in *TRANSDISCIPLINARY ENGINEERING: CROSSING BOUNDARIES*, 2016, vol. 4, pp. 672–681.
4	B. Bygstad, H.-P. Aanby, and J. Iden, *Leading digital transformation: THE SCANDINAVIAN WAY*, vol. 294. 2017.
5	S. Chanias and T. Hess, "Understanding digital transformation strategy formation: Insights from Europe's automotive industry," in *Pacific Asia Conference on Information Systems, PACIS 2016 - Proceedings*, 2016.
6	L. Danneels, "Digital Business Innovation of Public Services," in *ELECTRONIC GOVERNMENT AND ELECTRONIC PARTICIPATION*, 2016, vol. 23, pp. 320–327.
7	A. De Carolis, M. MacChi, E. Negri, and S. Terzi, "Guiding manufacturing companies towards digitalization a methodology for supporting manufacturing companies in defining their digitalization roadmap," in *2017 International Conference on Engineering, Technology and Innovation: Engineering, Technology and Innovation Management Beyond 2020: New Challenges, New Approaches, ICE/ITMC 2017 - Proceedings*, 2018, vol. 2018-January, pp. 487–495.
8	W. Du, S. L. Pan, and J. Huang, "How a latecomer company used IT to redeploy slack resources," *MIS QUARTERLY EXECUTIVE*, vol. 15, no. 3, pp. 195–213, 2016.
9	M. Economou, "Reinventing the academic museum: Studying the digital transformations at Glasgow's university museums," in *CEUR Workshop Proceedings*, 2014, vol. 1336, pp. 7–11.
10	P. Gray, O. A. El Sawy, G. Asper, and M. Thordarson, "Realizing strategic value through center-edge digital transformation in consumer-centric industries," *MIS QUARTERLY EXECUTIVE*, vol. 12, no. 1, pp. 1–17, 2013.
11	A. Horlacher, "Co-creating value - The dyadic CDO-CIO relationship during the digital transformation," in *24th European Conference on Information Systems, ECIS 2016*, 2016.
12	A. Horlacher and T. Hess, "What does a chief digital officer do? Managerial tasks and roles of a new C-level position in the context of digital transformation," in *Proceedings of the Annual Hawaii International Conference on System Sciences*, 2016, vol. 2016-March, pp. 5126–5135.
13	A. Horlacher, P. Klarner, and T. Hess, "Crossing boundaries: Organization design parameters surrounding CDOs and their digital transformation activities," in *AMCIS 2016: Surfing the IT Innovation Wave - 22nd Americas Conference on Information Systems*, 2016.
14	R. J. Kauffman, T. Li, and E. van Heck, "Business Network-Based Value Creation in Electronic Commerce," *INTERNATIONAL JOURNAL OF ELECTRONIC COMMERCE*, vol. 15, no. 1, pp. 113–143, FAL 2010.
15	N. Kröger and F. Teuteberg, "IT consultants as change agents in digital transformation initiatives," in *Multikonferenz Wirtschaftsinformatik, MKWI 2016*, 2016, vol. 2, pp. 1019–1030.
16	U. Lichtenthaler, "Shared Value Innovation: Linking Competitiveness and Societal Goals in the Context of Digital Transformation," *INTERNATIONAL JOURNAL OF INNOVATION AND TECHNOLOGY MANAGEMENT*, vol. 14, no. 4, Aug. 2017.
17	D. Liu, S. Li, and T. Yang, "Competitive business model in audio-book industry: A case of china," *JOURNAL OF SOFTWARE*, vol. 7, no. 1, pp. 33–40, 2012.
18	D.-Y. Liu, S.-W. Chen, and T.-C. Chou, "Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project," *MANAGEMENT DECISION*, vol. 49, no. 10, pp. 1728–1742, 2011.
19	M. I. Manda, "Towards 'Smart Governance' Through a Multidisciplinary Approach to E-government Integration, Interoperability and Information Sharing: A Case of the LMIP Project in South Africa," in *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 10428, 2017, pp. 36–44.
20	Y. Masuda, S. Shirasaka, S. Yamamoto, and T. Hardjono, "Risk Management for Digital Transformation in Architecture Board: A Case Study on Global Enterprise," in *Proceedings - 2017 6th IIAI International Congress on Advanced Applied Informatics, IIAI-AAI 2017*, 2017, pp. 255–262.
21	A. Nerurkar and I. Das, "Agile project management in large scale digital transformation projects in government and public sector: A case study of DILRMP project," in *ACM International Conference Proceeding Series*, 2017, vol. Part F128003, pp. 580–581.
22	P. Parviainen, M. Tihinen, J. Kaariainen, and S. Teppola, "Tackling the digitalization challenge: how to benefit from digitalization in practice," *IJISPM-INTERNATIONAL JOURNAL OF INFORMATION SYSTEMS AND PROJECT MANAGEMENT*, vol. 5, no. 1, pp. 63–77, 2017.
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25	C. J. Saul and H. Gebauer, "Digital Transformation as an Enabler for Advanced Services in the Sanitation Sector," *SUSTAINABILITY*, vol. 10, no. 3, Mar. 2018.
26	R. Schmidt, M. Möhring, F. Bär, and A. Zimmermann, "The Impact of Digitization on Information System Design - An Explorative Case Study of Digitization in the Insurance Business," in *Lecture Notes in Business Information Processing*, vol. 303, 2017, pp. 137–149.
27	A. Singh and T. Hess, "How chief digital officers promote the digital transformation of their companies," *MIS QUARTERLY EXECUTIVE*, vol. 16, no. 1, pp. 1–17, 2017.
28	H. L. Tay and S. W. K. Low, "Digitalization of learning resources in a HEI – a lean management perspective," *INTERNATIONAL JOURNAL OF PRODUCTIVITY AND PERFORMANCE MANAGEMENT*, vol. 66, no. 5, pp. 680–694, 2017.
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