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Digital Strategy in Information Systems: A Literature Review and an Educational Solution Based on Problem-Based Learning

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ABSTRACT

In recent years, there has been a considerable amount of information systems (IS) research on digital strategy. However, it is not clear how digital strategy is taught in higher education. To investigate this issue, we conducted a literature review on digital strategy in the IS field and IS education. We then developed a digital strategy course using the problem-based learning (PBL) approach with constructivism as a theoretical lens. The research contributes to the literature by illustrating the key differences between digital strategy and IT/IS strategy while providing insight into the dimensions of digital strategy. These dimensions are digital strategy environments, digital strategy visions, digital strategy approach, digital strategy capabilities, digital strategy stakeholders, and digital strategy challenges. We then used these dimensions as inputs to design the digital strategy course. We contribute to IS education by proposing a meta-requirement for the digital strategy course based on the PBL approach and provide an example of the course syllabus.

Keywords: Problem-based learning (PBL), Literature review, Information systems education, Graduate course, Digital strategy, Digital transformation

1. INTRODUCTION

We are living in a rapidly digitalizing world where new opportunities are being created at the same time as traditional business models are being disrupted. It has been predicted that 40% of today's Fortune 500 companies on the S&P 500 will disappear by 2025 due to technological change (Nanterme, 2016; Vayghan, 2018). Therefore, there is an urgency for organizations to adopt new strategies based on digital technologies. These new strategies are frequently referred to in the context of digital strategy as they are organizational strategies that aim to provide value and produce opportunities through digital technologies. Digital technologies include cloud, mobile, analytics, social media, platforms, Internet, software, and blockchain technologies (Ross et al., 2016). Thus, we define digital strategy as an organizational strategy aimed at providing value and producing opportunities through digital technologies.

Although the digital strategy itself is ambiguous and incongruent among academics and practitioners in the IS community (Bharadwaj et al., 2013; Dang & Vartiainen, 2019), several scholars agree that digital strategy has a more organization-wide scope compared to the traditional information systems/information technology (IS/IT) strategy (Chanias et al., 2018; Mithas et al., 2013). As traditional IS/IT

strategy has been positioned as a functional-level strategy, it must align with the organization's chosen business strategy (Bharadwaj et al., 2013; Henderson & Venkatraman, 1993; Venkatraman, 1994). Moreover, several literature reviews on digital strategy in IS have recently been conducted (Bockschecker et al., 2018; Vial, 2019). Unfortunately, there is a dearth of research on digital strategy in IS education, which serves as our motivation for studying this issue. We focus on two research questions: (1) What are the main dimensions of digital strategy? (2) How is a digital strategy course designed for IS students?

To answer our research questions, we designed a two-step research process. We first conducted a systematic literature review on digital strategy in the IS field, focusing on the leading IS journals and IS conferences as well as IS outlets with a focus on education. From these outlets, we selected 43 research and empirical papers for the study. We omitted other types of papers, such as opinion papers, commentaries, editorials, and literature reviews. Second, we used the results of our literature review as input to propose a meta-requirement for a digital strategy course based on the problem-based learning (PBL) approach and constructivism as a theoretical lens.

Our contribution, therefore, is two-fold. First, we provide insights into the differences between the traditional IS/IT strategy and digital strategy. We also illustrate six main

dimensions (including examples) of digital strategy: digital strategy environments, digital strategy visions, digital strategy approach, digital strategy capabilities, digital strategy stakeholders, and digital strategy challenges. We view that these dimensions are important not only for researchers but also for practitioners as they discuss and implement digital strategy. Second, our proposed meta-requirement for a digital strategy course will provide educators with examples of designing a course based on the PBL approach and the dimensions discussed in the literature.

The paper is organized as follows. Section 2 illustrates the background, while the methods section is provided in Section 3. This is followed by Section 4, which presents the literature review findings. We then present the meta-requirement for the digital strategy course in Section 5. The discussion is presented in Section 6, and the paper ends with a concluding section.

2. BACKGROUND

Several literature reviews have been conducted on the topic of digital strategies. For example, Stockhinger and Teubner (2018) reviewed the concept of digital strategy through the lens of management consultancies. They adapted empirical content analysis and found four ways of looking at digital strategy: the strategy level, the governance strategy, the devices of manifestation, and the strategizing logic. Furthermore, Bockschecker et al. (2018) conducted a literature review on the concept of digital transformation by clarifying, from a socio-technical perspective, what is meant by digitization, digitalization, and digital transformation. Recently, Vial (2019) reviewed the IS literature on digital transformation, provided a conceptual definition of digital transformation, and proposed a research agenda for future research on digital transformation. In particular, he discussed two research agendas, including a study on how dynamic capabilities contribute to digital transformation and another on the strategic relevance of ethics in digital transformation.

While these studies focus on clarifying the concept of digital strategy using a range of perspectives from consultancies to researchers, they do not consider educational perspectives. Our study addresses this gap by focusing more on the dimension of establishing a practical digital strategy in organizations. In other words, we look inside digital strategy and how it is discussed in the literature and used in organizations. We then use the various dimensions as input to design a digital strategy course for IS education in higher education.

3. METHODS

To achieve our aims, we conducted a systematic literature review (Webster & Watson, 2002). We followed the practical guidance of Paré et al. (2016) to increase the trustworthiness of the review, minimize errors and biases, and ensure reliability. For example, we focused on developing a review plan, searching the literature, selecting studies, assessing the quality of the selected studies, extracting key aspects from these studies, analyzing the data, and formulating conclusions.

The review process consisted of two main phases: selecting studies and extracting data. As we aimed to provide an analysis of the field rather than a descriptive overview (Paré et al., 2016), we used coding techniques adapted from grounded theory

(Glaser & Strauss, 1967; Strauss & Corbin, 1998); for instance, we used open and selective coding techniques to analyze and identify patterns and dimensions of digital strategy and collected evidence and concerns from the selected papers. These two phases are described below.

3.1 Selecting Studies

There were several steps in this phase. First, we identified the search terms and types of papers. We used Google Scholar to search for frequently cited papers with the term “digital strategy” and preceded to skim through papers citing our searching papers. This enabled us to identify relevant terms with which to search paper titles, abstracts, keywords, and/or the body: “digital* strateg,*” “digital transformation,” “digitalization,” “digital disruption,” “digital infrastructure.”

Second, we focused on empirical and research papers in the “basket of eight” IS journals (AIS, 2020), which are recognized as top journals in the IS field: Management Information Systems Quarterly (MISQ), Information Systems Research (ISR), European Journal of Information Systems (EJIS), Information Systems Journal (ISJ), Journal of Association for Information Systems (JAIS), Journal of Information Technology (JIT), Journal of Management Information Systems (JMIS), and Journal of Strategic Information Systems (JSIS). We also expanded our databases for the Journal of Computer Information Systems (JCIS) and the Journal of Information Systems Education (JISE) because they are recognized as reputable journals in the fields of IS pedagogy and curriculum studies (Osatuyi et al., 2018). Further, we focused on the proceedings of the International Conference on Information Systems (ICIS), which is considered the leading IS conference. Noteworthy, we only considered papers presented from 2016-2019 for the proceedings of the ICIS as we assumed that earlier papers would have appeared in journal outlets.

Third, we considered three main databases or sources for our paper search: Web of Science, AIS Electronic Library (AISeL), and the respective journals’ website or portal. In particular, “Topic” was used for Web of Science, “Title,” “Abstract,” and “Subject” for AISeL and the journals’ website or portal. We also acknowledged that, in some papers, the term did not appear in the topic, title, or abstract but appeared in the content or with other terms. Therefore, we added additional keywords in order to increase the possibility of identifying papers on the relevant topic, for example, “digital transformation,” “digitalization,” and “digital disruption” (see Appendix A for details).

Finally, the study selection process was as followed: we first read and assessed the papers based on their title, abstract, and keywords. To minimize bias, we conducted two rounds of assessment for every paper; we also paid attention to the papers that fit our research aims and those that we eliminated. During this process, some papers were difficult to categorize (for elimination or retention). In such cases, we re-assessed the papers by reading the full text so as to ensure the best decisions were made. As a result, we found 1,631 papers in total in the first round. In the second round, we narrowed this to 100 papers with a focus on digital strategy and its relevant issues. We then eliminated those papers that focused only on commentaries or opinions. After this round, we selected 43 papers for the study, 35 of which came from the AIS basket of eight journals and seven from the ICIS conference. The process of choosing the papers is summarized in Figure 1 below.

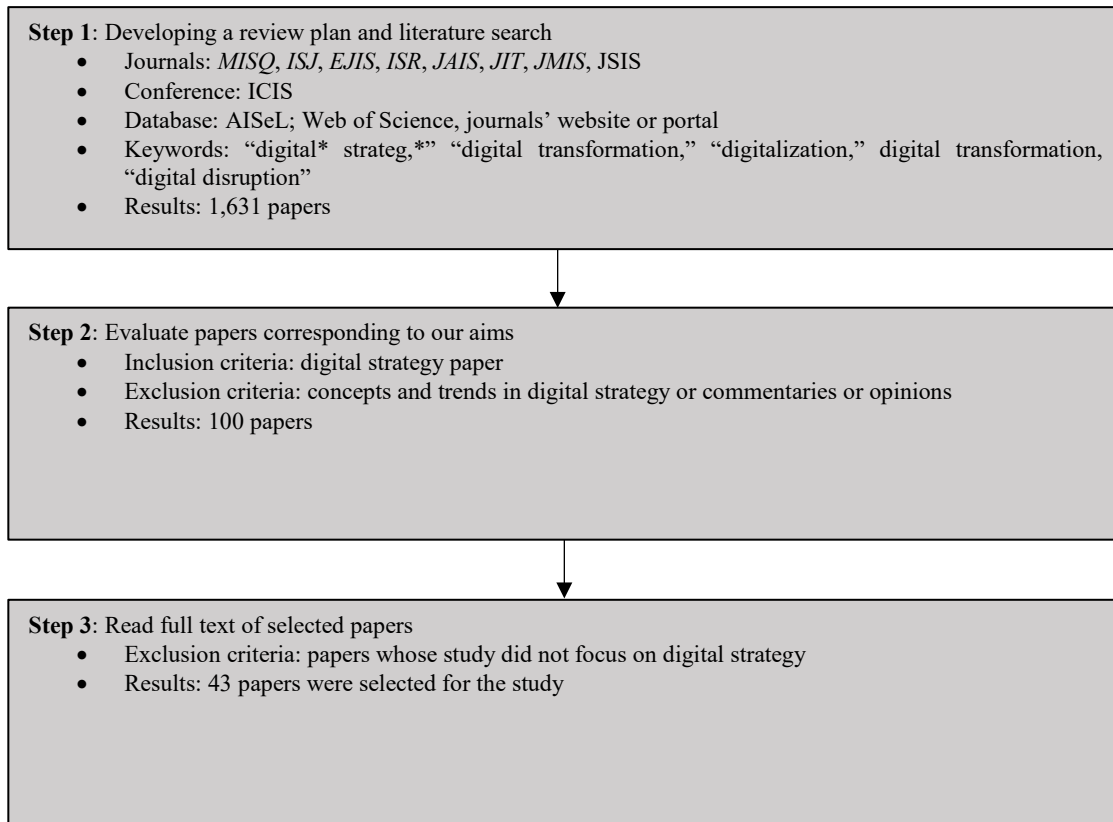


Figure 1. Process of Paper Selection

3.2 Extracting Data

We conducted several iterative coding processes in order to assess, extract, analyze, and formulate our conclusions. In particular, our analysis was guided by a review framework (see Appendix A) consisting of five main issues: (a) the core idea of the paper; (b) the conceptualization of the terms; (c) the methods used by the author(s); (d) the theory(s) used or developed; and (e) future research or suggestions.

The data extraction from the selected papers followed the above framework. We then organized all the codes emerging from the iterative coding process. For the selected papers, we coded and recorded all the content or issues related to the research aims, such as definitions or views of the term, differences between IT/IS strategy and digital strategy.

We adopted grounded coding techniques (Glaser & Strauss, 1967; Strauss & Corbin, 1998) to identify key phenomena emerging from the data. For example, we used an open and selective coding approach to analyze and identify patterns of digital strategy and collected evidence and concerns in the selected papers (Paré et al., 2016; Webster & Watson, 2002). We categorized the codes and marked them with appropriate labels and corresponding papers, refining the codes when necessary. Finally, the categories were grouped into broader aspects or categories, which is illustrated below (see Appendix A for examples).

4. FINDINGS

In this section, we highlight two main findings: (1) digital strategy and IT/IS strategy, and (2) digital strategy dimensions.

4.1 Digital Strategy and IT/IS Strategy

There is no consensus on a definition of digital strategy. The literature points to three terms to indicate digital strategy (Bharadwaj et al., 2013; Chanas et al., 2018; Hess et al., 2016; Ross et al., 2016). These are digital strategy (Ross et al., 2016; Seo, 2017; Stockhinger & Teubner, 2018), digital business strategy (Bharadwaj et al., 2013; Oestreicher-Singer & Zalmanson, 2013; Woodard et al., 2013), and digital transformation strategy (Chanas et al., 2018; Hess et al., 2016; Singh & Hess, 2017). In this paper, digital strategy refers to an organizational strategy aimed at providing value and producing opportunities through digital technologies. In this definition, organizations relate to any collection of humans with a particular purpose. Thus, it does not limit the digital strategy concept to businesses or firms; rather, it can also be applied at the micro (e.g., individuals, groups) and macro levels (e.g., industrial or societal contexts). We also relate digital strategy to digital technologies (Vial, 2019).

The term "digital" has increasingly been used as an established concept in the IS field (Bogusz & Morisse, 2018; Tumbas et al., 2018). However, the difference between digital strategy terms and well-established IS/IT concepts is not clear (e.g., IS/IT strategy, IS/IT transformation). Therefore, we

discuss some characteristics of digital strategy in comparison to those of IS/IT strategy. In the selected papers, certain characteristics distinguished between IS/IT strategy and digital strategy.

First, there is a dominant view that IS/IT strategy is a functional-level strategy that both aligns with and is subordinated to business strategy. This means that business strategy directs IS/IT strategy, that IS/IT strategy has been positioned as a functional-level strategy, and that IS/IT strategy must be aligned with the organization's chosen business strategy (Bharadwaj et al., 2013; Henderson & Venkatraman, 1993; Venkatraman, 1994). This view is represented in many studies, such as IT outsourcing, IT business values, and business processes (Chan & Reich, 2007; Bharadwaj et al., 2013; Moeini et al., 2019).

Second, digital strategy has a more organization-wide scope compared to traditional IS/IT strategy (Chanias et al., 2018; Mithas et al., 2013). Many scholars believe that the role of IS/IT strategy should move from a functional-level strategy to a fusion between IT strategy and business strategy. For example, Bharadwaj et al. (2013) maintained that they do not necessarily separate IS/IT and business strategy as in traditional IS/IT strategy research. Similarly, Chanias et al. (2018) viewed digital strategy as encompassing a fusion of IS and business strategy, whereby there is no clear distinction between the two.

Third, IS/IT strategy seems to be technology-oriented, while digital strategy is business- and customer-oriented (Chanias et al., 2018; Sebastian et al., 2018). Thus, all stakeholders are involved in the digital strategy with distinct governance structures in comparison to the IS/IT strategy (Chen et al., 2010; Bharadwaj et al., 2013). It can be noted that a digital strategy does not necessarily replace other strategies, but it is necessary to align it with others (Chen et al., 2010; Drnevich & Croson, 2013).

4.2 Digital Strategy Dimensions

Through our analysis, described in the methods section, we identified several dimensions of digital strategy. We also provide an example of each dimension of digital strategy in Section 4.3 (Table 1).

4.2.1 Digital Strategy Environment. Organizations are influenced or triggered under the pressures of surrounding environments, both internal and external, to implement digital strategy (Feller et al., 2011). Thus, environmental factors drive organizations to implement digital strategy, which in turn helps organizations take advantage of digital technologies, such as social media, platforms, Internet of Things, mobile technologies, and analytics tools. It also helps organizations as they revise their value propositions (Hanelt et al., 2017; Jarvenpaa & Standaert, 2018; Tim et al., 2018; Woodard et al., 2013).

The papers selected for this study indicate that external environments play an important role in leading organizations to form and implement their digital strategy. An example of an external environment is the industrial environment (i.e., industry turbulence, industry competition, and industry growth), and the literature shows that the industrial environment has a tremendous impact on organizations' digital strategy adoption (Mithas et al., 2013; Pavlou & Sawy, 2006; Wade & Hulland, 2004). Industry turbulence refers to atmospheric instability; industry competition refers to rivalry;

and industry growth refers to opportunities for growth (Melville et al., 2007; Mithas et al., 2013; Pavlou & Sawy, 2006; Wade & Hulland, 2004). Other factors associated with external environmental issues include regulatory changes and external digital trends, which could impact organizational strategy (Bharadwaj et al., 2013; Klecun, 2016).

The internal environment also influences digital strategy in organizations. For example, organizational shifts (i.e., limitations of traditional business models, trans-functional roles for IT) can drive digital strategy (Bharadwaj et al., 2013). Moreover, IT investments (e.g., investments in IT, firms' IT budget) play an important role in digital strategy (Mithas et al., 2013).

4.2.2 Vision in Establishing Digital Strategy. Several papers discussed the importance of vision in establishing a successful digital strategy. The literature discussed vision as inclusive of value propositions (i.e., a set of propositions regarding a company's business model), operational backbone (i.e., a set of business and technology capabilities that ensure the efficiency, scalability, reliability, quality, and predictability of core operations), and digital services backbone (i.e., a set of business and technology capabilities that enable rapid development and implementation of digital innovations) (Feller et al., 2011; Pagani, 2013; Ross et al., 2016).

Companies should have a clear vision of their digital strategies. In particular, they should have value propositions that they pursue, an operational backbone through which to operate their digital strategy and a digital service backbone to facilitate rapid innovation and responsiveness to new market opportunities (Pagani, 2013; Ross et al., 2016). For example, considering the conditions under which a digital strategy can contribute to achieving strategic advantages and transform into market performance, organizations should consider customer heterogeneity, technological turbulence, and the share of business services vis-à-vis their digital strategy (Leischnig et al., 2016). Social media can be used to facilitate an organization's environmental sustainability vision and community-driven environmental sustainability vision (Tim et al., 2018). Technological flexibility and digital eco-innovation enhance business process efficiencies and, thus, the achievement of organizational sustainability visions (Hanelt et al., 2017; Thai et al., 2021).

4.2.3 Approaches to Establishing Digital Strategy. The literature also discussed approaches to establishing a digital strategy, including multiple levels, dynamic and flexible processes, and customer engagement.

First, a digital strategy should be regarded as a fusion with an organization-wide scope (Chanias et al., 2018; Mithas et al., 2013; Whelan et al., 2013) with an enterprise-wide architecture strategy (Dang et al., 2019; Dang & Pekkola, 2020; Dang, 2021) as the process of implementing a digital strategy affects multiple levels in the organization (Bharadwaj et al., 2013; Lyytinen et al., 2016; Singh & Hess, 2017; Sebastian et al., 2018). Approaches to establishing a digital strategy include the bottom-up approach (e.g., starting with scattered initiatives in various business units), the IT-centered approach (e.g., the first place as a technology-focused project), the innovation-centered approach (e.g., developing innovative solutions and pushing forward industry standards), the channel-centered approach (e.g., building and improving digital channels as the first key

activity of a digital strategy), and the centralized approach (e.g., a holistic approach to digital strategy) (Berghaus & Back, 2017).

Second, digital strategy in practice should be considered as a process of strategy-making with dynamic and flexible approaches. For example, the process of strategy-making is highly dynamic and involves iterating between learning and doing (Chanias et al., 2018). Moreover, the design of digital artifacts should also consider design capital (i.e., the cumulative stock of designs owned or controlled by a firm) and design moves (i.e., the discrete strategic actions that enlarge, reduce, or modify a firm's stock of designs) (Woodard et al., 2013).

Finally, organizations should take into consideration customer engagement and digitized solutions when implementing their digital strategy (Ross et al., 2016). For example, if organizations integrate social media into their businesses, they should take a strategic rather than a techno-centric view and focus on digital content involving user participation. This may help organizations take advantage in comparison to those that use social media as a substitute for offline soft marketing (Oestreicher-Singer & Zalmanson, 2013).

4.2.4 Digital Strategy Capability. The selected papers discussed capability as one of the important dimensions of digital strategy. Capabilities help organizations drive and successfully implement their digital strategy (Li et al., 2017; Sandberg et al., 2014). In other words, organizations should have the capabilities to pursue a successful digital strategy (Ross et al., 2016). Although there are several capabilities (Adner & Helfat, 2003; Helfat & Winter, 2011; Helfat & Martin, 2015; Stefano et al., 2014), the most frequently discussed in the selected papers were dynamic managerial capabilities (i.e., managerial cognition, managerial social capital, managerial human capital) and organizational capabilities (e.g., channel management capabilities, R&D capability) (Li et al., 2017).

First, dynamic managerial capabilities refer to “the capabilities with which managers build, integrate, and reconfigure organizational resources and competences” (Adner & Helfat, 2003, p. 1012). Several capabilities have been conceptualized primarily in terms of dynamic managerial capabilities, including IT capability (Nwankpa & Datta, 2017), market intelligence capability (e.g., the ability to process market information to support managerial decision-making purposely) (Leischnig et al., 2017), and customer-side capabilities (i.e., customer-orientation capability and customer response capability) (Setia et al., 2013). These capabilities help organizations in their ability to respond to achieving strategic advantages and high market performance as well as customer needs (Leischnig et al., 2017; Setia et al., 2013). IT capability is said to positively influence organizational performance (Nwankpa & Datta, 2017). Market intelligence capability is seen as one component that may help organizations achieve strategic advantages and high market performance when they implement a digital strategy (Leischnig et al., 2017). This is because market intelligence capability enables organizations to adapt to the changes surrounding the organizational environment and equips them to respond to opportunities and threats (Adner & Helfat, 2003; Eisenhardt & Martin, 2000; Leischnig et al., 2017). Customer-orientation capability and customer response capability are said to help in successfully

implementing an organization's customer-side digital strategy (Setia et al., 2013). These capabilities help an organization to locally sense and respond to customer needs as well as enhance customer service performance through the digital design of information quality (Pavlou & Sawy, 2006; Setia et al., 2013).

Second, organizational capability involves when organizations “perform a particular activity in a reliable and at least minimally satisfactory manner” (Helfat & Winter, 2011, p. 1244). Dynamic managerial capabilities and organizational capabilities help facilitate organizational strategic changes when the organization implements digital strategy (Helfat & Martin, 2015; Li et al., 2017). One aspect of this capability is mobilizability, which refers to “organizations' ability to actively organize or influence other organizations on the emergence and evolution of fields and the field orders and rules in a field” (Seo, 2017, p. 688). Mobilizabilities can be political, social, and technological in nature. It is said that organizations should also consider using different types of mobilizabilities to take advantage of others (Seo, 2017) when they establish a successful digital strategy.

4.2.5 Digital Strategy Stakeholders. Several stakeholders take part in the processes of implementing digital strategies, and the main ones discussed in the selected papers were managers and the chief digital officer (CDO).

First, many organizations have established the new job title of CDO and new roles in association with digital strategy to articulate and develop the emerging digital logics and integrate them into business strategies (Rickards et al., 2015; Singh & Hess, 2017; Tumbas et al., 2018). This is because the initiation of digital strategy use in organizations signifies a departure from the traditional practice (Baird & Raghu, 2015; Ciriello et al., 2017; Flath et al., 2017; Lucas and MeinGoh, 2009; Fichman et al., 2014; Tumbas et al., 2018). Moreover, the literature discussed two main CDO-related organizational roles: they articulate and develop the emerging digital logics (focusing on new initiatives, revenue enhancing, etc.) and integrate these logics into business strategies (Tumbas et al., 2018). However, the CDO title, its roles, and associated meanings differ among organizations, likely overlapping with those of other established professions, such as the chief information officer (Singh & Hess, 2017; Tumbas et al., 2018).

Second, several papers discussed the roles of managers in relation to digital strategy. Managers (e.g., CEOs, senior managers) are an important stakeholder in digital processes because the managerial issue is seen as more important than the technical issues involved in digital strategy (Besson & Rowe, 2012; Feng et al., 2009; Feller et al., 2011; Nwankpa & Datta, 2017). After all, managers drive and decide on the organizational strategy (Andrade Rojas et al., 2016; Li et al., 2017). Examples of managers' capabilities include personal beliefs and mental models of decision-making, formal and informal relationships with others, expertise, and skills (Helfat & Martin, 2015). The literature also addressed the importance of e-leadership, defined as “a social influence process embedded in both proximal and distal contexts mediated by digital technology that can produce a change in attitudes, feelings, thinking, behavior and performance” (Li et al., 2016, p. 12). It ranges from the micro (e.g., individuals, groups) to macro (e.g., industry or society) levels and enables organizations to successfully achieve their digital strategy

through strategy alignment, technology alignment, competitive alignment, and service-level alignment (Li et al., 2016).

4.2.6 Digital Strategy Challenges. The selected papers also discussed the challenges involved in the organizational implementation of digital strategies. Organizations face many challenges when considering an appropriate digital strategy (Ross et al., 2017; Sebastian et al., 2018; Weil et al., 2015). This is because the uncertainty of digital technologies leads to radical and disruptive changes in organizations at multiple levels and services and a highly dynamic context of both business and IS/IT perspectives (Berghaus & Back, 2017). Two of the main challenges include misalignments and paradoxes.

According to the literature, misalignments are one of the biggest challenges involved in implementing a digital strategy (Chan et al., 2019; Yeow et al., 2018). This is so because organizations operate in dynamic environments in the context of digital strategy, and digital strategies involve multi-level organizational functions that require large-scale, cross-organizational changes (Bharadwaj et al., 2013; Peppard et al., 2014; Yeow et al., 2018).

The other challenge is dealing with paradoxes, which are “contradictory yet interrelated elements that exist simultaneously and persist over time” (Smith & Lewis, 2011, p. 382). Paradoxes may appear at different levels during the process of implementing a digital strategy, and create tensions in the implementation process (Chan et al., 2019; Yeow et al., 2018). Organizations have to invest in technologies and

improve their capabilities in order to reposition or re-design their strategy in the digital era. This may lead to changes in different levels, services, and procedures in the organization. Organizations also have to deal with several paradoxes in successfully designing a new digital strategy, such as existing versus requisite capabilities, internal versus external collaboration, and control versus flexible governance (Gregory et al., 2010; Svahn et al., 2017; Sebastian et al., 2018).

At the organizational level, paradoxes include existing versus requisite capabilities, product versus process focus, internal versus external collaboration, and control versus flexibility governance (Svahn et al., 2017). Examples of paradoxes at the functional level (e.g., IT programs) include efficiency versus innovation, standardization versus differentiation, integration versus replacement, program agility versus project stability, program control versus project autonomy, and program delivery versus project isolation (Gregory et al., 2010). However, paradoxes may also appear elsewhere. There was insufficient attention in the literature on broader issues in IS research, such as digital strategy in the context of other existing programs or applications (e.g., enterprise architecture) and digital strategy in public versus private sectors.

4.3 Illustrative Examples of Digital Strategy in Practice

To illustrate the digital strategy dimensions presented in the previous section, we provide case examples from the empirical data in the selected papers (Table 1).

Dimensions	Properties	Illustrative case example
Environment	External environment	The external environment regarding B2C e-commerce influenced Hummel’s digital strategy (Yeow et al., 2018).
	Internal environment	Hummel purposefully changed their internal processes and structures to adapt to the changing environment when the company implemented its digital strategy (Yeow et al., 2018).
Vision	Value proposition	General Electric repositioned its value proposition from traditional product engineering to analyzing, predicting, and improving the productivity of assets (e.g., wind turbines and aircraft engines) and operations via IoT capabilities (Ross, 2016; Winig, 2016).
	Operational backbone	Lego Group’s operational backbone started with an ERP implementation in 2004, which provided standardized processes related to human resource management, manufacturing, and product lifecycle management (Ross et al., 2016).
	Digital services backbone	Philips developed its cloud-based HealthSuite digital platform, which helps collect, aggregate, and analyze health, lifestyle, and clinical data from more than seven million connected devices, sensors, mobile apps, and electronic health records systems (Philips Strengthens, 2015).
Approach	Multiple levels	AssetCo organized regular workshops involving multiple organizational levels (e.g., top management, divisional management, mid-management, and lower-level employees) (Chanas et al., 2018).
	Dynamic and flexible process	Different AssetCo units decided on a parallel course of action in the early stage of implementing their digital strategy and incrementally incorporated learning into their digital strategy at later stages (Chanas et al., 2018).
	Customer engagement	Kaiser Permanente pursued a customer engagement strategy called “consumer digital strategy”. The company considers healthcare as a collaboration between providers and members through digital technologies (Ross et al., 2016).
Capability	Dynamic managerial capabilities	Alibaba organized a series of executive training programs to help SMEs improve the managerial cognitions of entrepreneurs (e.g., personal beliefs and mental models for decision-making) (Li et al., 2017).
	Organizational capabilities	Apple had capabilities to establish a new norm of distributing music through the Internet. It has since become a taken-for-granted approach for the music industry (Isaacson, 2011).
Stakeholders	Chief digital officer (CDO)	CDOs were established in several companies in different industry sectors, such as health care, advertising, software, banking, finance, and manufacturing (Tumbas et al., 2018).
	Managers	AssetCo managers drove the company’s transformation (Chanas et al., 2018).
Challenges	Misalignments	There were misalignments between the new digital B2C strategy and the existing B2B resources at Hummel (Yeow et al., 2018).
	Paradoxes	Volvo Cars’ Connected Car Initiative faced several paradoxes such as existing vs. requisite capabilities, internal vs. external collaboration, and control vs. flexible governance (Svahn et al., 2017).

Table 1. Digital Strategy Dimensions: Properties and Illustrative Case Examples

Previous literature reviews on digital transformation have found varied results of digital strategy. For example, four perspectives of digital strategy—strategy level, strategy governance, the devices of manifestation, and the strategizing logic (Stockhinger & Teubner, 2018)—focus on clarifying the term (Bockschecker et al., 2018; Vial, 2019). While these studies help clarify the term and the process of implementing a digital strategy, our findings provide six main digital strategy dimensions discussed in the literature. Practitioners can use these examples when implementing a digital strategy in an organization. These examples can also help educators in designing or teaching topics or courses related to digital strategy.

5. META-REQUIREMENTS FOR A DIGITAL STRATEGY COURSE

In this section, we present the philosophy underlying our course design and propose a meta-requirement for our course. We choose constructivism as a philosophy to guide our course

design because it posits that learners acquire knowledge through knowledge construction rather than knowledge transmission (Applefield et al., 2000). This is especially applicable to digital strategy as it is considered a new information system (Bharadwaj et al., 2013) that brings new conceptualizations, new ways of thinking about strategy, logic, and topics that may be difficult for learners to grasp through transmission from others.

5.1 Constructivism and Problem-Based Learning

Constructivism assumes that perceptions, sensations, and knowledge cannot exist outside one’s mind. New knowledge is constructed within individuals through their experience in relation to the environments surrounding them (Hendry et al., 1999). In other words, in the view of constructivists, learners learn through their active cognitive and social processing of knowledge (Schmidt, 1994; Tynjälä et al., 2009). The philosophy of constructivism has had an important role in higher education (Olssen, 1996; Tynjälä, 1999). Table 2 summarizes the main pedagogical features of constructivism.

Principle #	Terminology	Feature of constructivism in pedagogy	Selected reference
1	Prior knowledge	Learners’ previous knowledge, beliefs, conceptions, and misconceptions are taken into consideration in the instructional design.	Hendry, 1996; Reinders, 2012; Vosniadou, 1994
2	Individual study	Learners’ meta-cognitive and self-regulation skills and knowledge are important.	Boekaerts, 1996; Silvén, 1992; Vermunt, 1995
3	Group functioning	Learners’ discussion and different forms of collaboration are emphasized in terms of negotiating and sharing meanings.	Dillenbourg, 1999; Gergen, 2001
4	Situated functioning	The situational nature and simulated environments of learning are considered.	Eraut, 1994; Lave and Wenger, 1991
5	Developing artifact	Problem-solving and the constructions of artifacts are considered as main learning processes.	Bruner, 1996; Lonka and Ahola, 1995
6	Teacher performance	Teachers serve as supporters and facilitators of the learning process of learners.	Prawat, 1996; von Glasersfeld, 1998
7	Assessment process	Assessment is based on process-oriented focusing on learners’ individual orientations and meta-cognitive skills.	Biggs, 2012; Dochy and Moerkerke, 1997

Table 2. Main Pedagogical Features of Constructivism (adapted from Tynjälä et al., 2009, cited from Tynjälä, 1999)

Given that the development process of a digital strategy can take years to progress from initial idea generation to strategy use (Chanas et al., 2018; Vial, 2019), we view that PBL might not be appreciable. Instead, as a constructivist educational approach (Hendry et al., 1999; Rovers et al., 2018) that enhances learners’ capability to solve real-world problems (Hendry et al., 1999; Schmidt, 1994), it could be used to develop a digital strategy course. Through this approach, the course would be guided by teachers who act as cognitive coaches, and learners would develop problem-solving, critical thinking, and collaborative skills.

Based on dimensions and illustrative examples from the literature presented in the preceding sections, we propose a meta-requirement to design the course based on the PBL theoretical lens. We also take into consideration a “causal and quantitative representation of the learning going on in a problem-based context,” as proposed by Schmidt et al. (1995, p. 84). This model comprises seven key variables: (1) amount of prior knowledge; (2) quality of problems; (3) tutor performance; (4) group functioning; (5) time spent in individual study; (6) interest in subject matter; and (7) achievement.

5.2 A Proposal on How to Design a Digital Strategy Development Course

We first present the application of the constructive design principles described in the theoretical section of a digital strategy course using PBL in IS (Table 3).

Based on these principles, we titled the design course the Digital Strategy (Development) Course, intended at the master’s level. The course was designed following the practical guide of Davis and Harden (1999) for PBL. According to this guide, problems are first formed based on six digital strategy dimensions and case studies. These problems provide the key units for structuring relevant learning. For example, teachers can establish scenarios or simulations based on these dimensions. Second, resources are used for self-learning. Students are given access to a range of resources. Primary resources are materials in IS/IT and digital strategies appearing in reputable IS journals and conferences. In addition, materials come from teachers and professionals and their peers as well as the library.

Principle #	Name	Application in digital strategy course using PBL
1	Prior knowledge	At the beginning of the course, learners engage in discussion and writing to reflect on previous knowledge, beliefs, conceptions, and misconceptions regarding IS strategy and digital strategy.
2	Individual study	Learners reflect on their own learning in course journals and weekly discussions with teachers. Learners monitor their time management.
3	Group functioning	Learners are encouraged to collaborate and solve their problems in a group, which is the basic unit of working and learning. These activities are supported through mentoring.
4	Situated functioning	Learners identify problems from cases in the literature as well as from clients who have successfully implemented a digital strategy.
5	Developing artifact	Learners undergo a process of planning and developing a problem-solving approach in each dimension, resulting in a concrete artifact.
6	Teacher performance	Teachers and guests/clients have regular discussions with learners.
7	Assessment process	The teachers and the guests/clients conduct assessments. Students' self-assessment focuses on the learning process.

Table 3. The Implementation of Constructivist Design Principles in Problem-based Learning

Third, the learning objectives are planned by teachers. There are four main objectives: digital strategy development skills, group-work skills, communications skills, and technical competence. Importantly, although the objectives are planned by teachers, the inputs are from learners. Learners identify the learning issues during the PBL process, and the aims and objectives may be refined and expanded by the students. Fourth, learners work in groups. Several stakeholders are also often involved in the process of designing a digital strategy (e.g., companies, professionals). Learners are faced with digital strategy situations and are engaged in critical reasoning and decision-making, both of which will be useful after graduation. Finally, learners learn in context knowledge, in an active way,

and with the help of peers, teachers, and mentors. Assessment is based on learning outcomes that implicate the problems presented to the students. The learning context is designed based on a schedule of timetabled sessions (Davis & Harden, 1998). Learners also learn through examples retrieved from the literature or cases. Through these examples, rules are established, leading to more sophisticated concepts that support higher-order thinking.

The meta-requirements are proposed for the digital strategy course from the course design and principles. The meta-requirements of the course are presented in Table 4.

Below, we elaborate on how each meta-requirement in Table 4 could be taught in the course.

#	Meta-Requirement	Description of the meta-requirement	Mapping with principle
M1	Reflection of prior knowledge of IS/IT and digital strategy	Students engage in discussion and writing to reflect on their previous knowledge, beliefs, conceptions, and misconceptions of IS/IT strategy and digital strategy.	Prior knowledge
M2	Studying the dimensions of digital strategy	Reflection of one's own learning with respect to the dimensions of digital strategy. At least six dimensions need to be introduced to students.	Individual study
M3	Studying the relations among the dimensions of digital strategy and evaluate them	Students study and evaluate the relations among the dimensions, propose other dimensions if possible, and analyze them based on different types of companies (e.g., finance, energy).	Group functioning
M4	Real-life connection to digital strategy	Students are provided with a real-life case.	Situated functioning
M5	Development of a digital strategy	Students establish and/or evaluate a digital strategy for an organization.	Developing artifact
M6	Active guidance	Students are guided/coached by internal or external specialists or experts	Teacher performance
M7	Assessment of a digital strategy and the process of developing it	The teacher assesses the digital strategy from the viewpoint of dimensions and processes of development.	Assessment process

Table 4: Meta-Requirements for the Digital Strategy (Development) Course

5.2.1 Reflection on Prior Knowledge of IS/IT and Digital Strategy. This meta-requirement requires students to reflect on their knowledge, beliefs, and misconceptions of IS/IT strategy and digital strategy (e.g., IS/IT strategy and their characteristics; differences between IS/IT strategy and digital strategy). This can be done through group discussions with

teachers acting as moderators. IS/IT strategy and digital strategy materials from reputable IS journals or conferences will be given to students. The assignment for this requirement will be report writing. The assignment type can be designed based on forum assignments, which means that students can see and comment on each other's assignment submissions. In

addition to feedback from teachers, peer feedback is encouraged through the learning management system's forum.

5.2.2 Studying the Dimensions of Digital Strategy. This meta-requirement focuses on studying all dimensions of digital strategy. For example, illustrative cases are analyzed to understand each dimension. This can be done through a lecture, through which dimensions, properties, descriptions, and examples will be introduced to students. In addition to lecture notes, materials related to digital strategy dimensions will be given to students. The assignments for this task, which will be completed individually by the students, will be critical comments on the dimensions. Forum assignments and peer feedback are recommended.

5.2.3 Studying the Relations Among the Dimensions of Digital Strategy and Evaluating Them. Students conduct an in-depth study of the digital strategy dimensions by analyzing the dimensions, applying each dimension to different types of companies (e.g., financial sector, energy sector), and evaluating each dimension through cases discussed in the literature or cases from companies. Students are also encouraged to refine, revise, or add dimensions if possible. Students will work in groups under the supervision of teachers and practitioners. Forum assignments and peer feedback for students' assignments are recommended.

5.2.4 Real-Life Connection to Digital Strategy. Companies implementing their digital strategy or in the process of doing so will be selected for this task. There will be workshops for companies and students, the aims of which will be to help students analyze how a digital strategy is designed in real life and how the strategy dimensions are implemented in companies. Those dimensions will be introduced in the previous tasks. Through the workshops, students can engage in discussions with practitioners about digital strategy in practice and draw conclusions when they reflect on what they have learned. Students will write a report about the companies' case as their assignments. Teachers and company experts will provide feedback.

5.2.5 Development of a Digital Strategy. Students will work in groups to establish a digital strategy in a company. As the process of establishing a digital strategy may be time-consuming, students could refine and improve an existing strategy by first evaluating it and then proposing an improvement to it. Mentors for this requirement will be experts from companies and universities. The outcome of this task will be an artifact (e.g., a digital strategy for a company or an improvement of an existing digital strategy). Students will produce artifacts together and will present and defend their artifacts in a workshop with mentors and teachers, who will evaluate that artifact.

5.2.6 Active Guidance. This meta-requirement indicates students will acquire and develop their skills throughout the course with guidance and coaching from teachers and company experts. For example, digital strategy development will be supervised and coached by mentors from companies.

5.2.7 Assessment of a Digital Strategy and the Process of Developing It. The assessment should support deep learning

and provide students with feedback about their learning (Postareff et al., 2012). Formative and summative assessments are recommended as the former allows assessment during the learning process, and developmental assessment aims to provide feedback about learning to the student and teacher (Crisp, 2012). The latter helps in assessing how well students have learned what they were supposed to learn (e.g., assessment of the end result). The teachers and experts involved in the process of assessment will focus on the dimensions of digital strategy and the process of developing a digital strategy.

6. DISCUSSION

6.1 Dimensions of Digital Strategy

From the papers selected for this study, we identified six main dimensions in the process of firms implementing their digital strategy. However, a majority of these dimensions were retrieved from born-digital companies, and less than five percent of our selected papers discussed the topic of digital strategy within established companies. It has been claimed that born-digital companies have different value propositions in comparison to established companies (Sebastian et al., 2018). As such, a digital strategy for established companies may differ from that of born-digital companies. This leads us to infer that the dimensions might differ from those of established companies. It would have been interesting if some of the studies had discussed dimensions in relation to established companies in different industrial sectors, such as the mining and energy sectors (Dang & Vartiainen, 2020; Jonsson et al., 2018; Svahn et al., 2017). This would have helped us present a balanced view on digital strategy dimensions as well as understand the digital strategy phenomenon in IS in a more in-depth manner.

In fact, the selected papers rarely discussed issues pertaining to security and privacy. As a result, security and privacy were left out of our proposal on the digital strategy dimensions. Noteworthy, in the literature, security and privacy are seen as having a negative impact on the outcomes of digital transformation in organizations (Tilson et al., 2010; Vial, 2019) and are seen as undesirable outcomes when organizations implement their digital strategy (McGrath, 2016; Piccinini et al., 2015; Zhu et al., 2006). However, we know very little about how the negative impacts of security and privacy turn to positive impacts as outcomes of digital strategies (Vial, 2019). A study on this issue will benefit not only companies but also individuals and society as a whole. We believe that security and privacy should be discussed from both academic and educational perspectives. For example, design science theory (cf., Hevner et al., 2004) can be used as one of the approaches that can help organizations improve their security and privacy during the process of implementing their digital strategy and achieving subsequent benefits for their organizations.

6.2 Digital Strategy Suggestion in IS Education

IS/IT strategy is considered one of the core competencies in IS education (Topi et al., 2010; ACM & IEEE, 2020). Traditionally, IS/IT strategy has been positioned at a functional-level strategy, aligned with the organization's chosen business strategy (Bharadwaj et al., 2013; Henderson & Venkatraman, 1993; Venkatraman, 1994). This view is also illustrated in the AIS/ACM's Curriculum Guidelines (Topi et al., 2010). However, the term "digital" was widely used before the well-established concepts in the IS field (Bogusz & Morisse, 2018;

Sandberg et al., 2014; Tumbas et al., 2018). For example, many scholars have recently proposed that digital strategy differs from the traditional IS/IT strategy as it moves from a functional-level strategy to a fusion between IT strategy and business strategy (Bharadwaj et al., 2013; Chanas et al., 2018).

As a result, this study discusses digital strategy skills that need to be considered when educators introduce digital strategy topics to students in higher education. We view that this is necessary as there is increasing attention on digital strategy in both academia and practitioners in the IS community (Bharadwaj et al., 2013; Stockhinger & Teubner, 2018). Digital strategy helps organizations digitalize and transform their business model for new revenue and opportunities (Ross et al., 2016). Consequently, IS students need skills to prepare them for the job market. We address this by proposing a meta-requirement for a digital strategy course in IS education. Based on this meta-level requirement, educators can tailor and design the digital strategy development course or a digital strategy module as part of the traditional IS strategy course, as suggested in the AIS/ACM's Curriculum Guidelines (Topi et al., 2010; ACM & IEEE, 2020). This can be considered a starting point for teachers who develop higher education digital strategy courses for IS students.

7. CONCLUSIONS

7.1 Contributions

In this research, we conducted a literature review on digital strategy in IS research and proposed a meta-requirement for a digital strategy development course. The paper makes several contributions. First, we revealed, from our literature review, key differences between digital strategy and IT/IS strategy, including the organization-wide scope, distinct governance structures, and business- and customer-oriented digital strategy compared to the traditional IT/IS strategy (Bharadwaj et al., 2013; Chanas et al., 2018; Henderson & Venkatraman, 1993; Mithas et al., 2013; Venkatraman, 1994).

Second, we pointed to six main digital strategy dimensions from the selected papers and illustrated examples of each dimension, including the digital strategy environment, the digital strategy vision, approaches to developing a digital strategy, digital strategy capabilities, digital strategy stakeholders, and digital strategy challenges. These dimensions can be seen as an initial guide for practitioners planning to implement a digital strategy in their organization. For example, the challenges revealed in this study may help organizations have a countermeasure, potentially reducing the risks during the implementation phase.

Third, this paper also provides a meta-requirement for a digital strategy course using constructivism as a philosophy-guided course design. This philosophy posits that learners acquire knowledge through knowledge construction rather than knowledge transmission. Specifically, the meta-requirement for a digital strategy course is built on seven principles and designed using PBL approaches. The course content is based on six dimensions and their illustrative examples from the literature. Moreover, we provide detail on how each meta-requirement could be taught in the course. We believe that this proposal can be seen as a starting point to integrate and revise the current IS strategy course for the IS field in higher education, as suggested by the AIS/ACM's Curriculum Guidelines (Topi et al., 2010). For example, teachers can tailor

their course using our principle to design a digital strategy course, or they can add a digital strategy module to complement their existing IS strategy course.

7.2 Limitations

This study has some limitations. We acknowledge that the basket of eight IS journals and the proceedings of the ICIS conference are not fully representative of the IS field. As a result, other contributions may appear outside of our selected outlets. Moreover, we recognize that digital strategy can be found in related fields, such as strategic management and sociology. Furthermore, our aim was to provide insights into dimensions of digital strategy, and we did not intend to make a theoretical contribution. We selected papers containing our search terms in their title, abstract, keywords, or body. This potentially leads to questions regarding whether the phenomenon can be addressed using these labels. Further study is needed to address the limitations herein, such as expanding the search database (e.g., DSS, MIS Quarterly Executive, and CAIS Journals; ECIS, AMCIS and PACIS conferences) or search terms.

We propose meta-requirements for the digital strategy course using the PBL approach under the guide of constructivism as a philosophy. However, we did not test our proposals in higher education. We are planning to design the course for IS students at the University of Vaasa.

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APPENDICES

Appendix A. Research Design and Selected Papers

Dimensions	Main questions
Core idea of the paper	What is the core research question, scopes, goals and results of the paper?
Conceptualization	How does the study conceptualize digital strategy, including author(s) means, definition, characteristics, opposed to traditional terms IT strategy?
Method	Methodologies and roles of theories, including approaches, data collection and analysis?
Theories	What theories have been used by the authors to substantiate their research?
Future research	What does the author(s) suggest for future research, as well as limitations?

Table A-1. Review Framework

#	Selected paper
1	Baird, A., and Raghu, T. S. 2015. "Associating Consumer Perceived Value with Business Models for Digital Services," <i>European Journal of Information Systems</i> (24:1), pp. 4–22.
2	Berghaus, S., and Back, A. 2017. "Disentangling the Fuzzy Front End of Digital Transformation: Activities and Approaches," in: ICIS. South Korea.
3	Bharadwaj, A., Sawy, O. A. E., Pavlou, P. A., and Venkatraman, N. 2013. "Digital Business Strategy: Toward a Next Generation of Insights," <i>MIS Quarterly</i> (37:2), pp. 471-482.
4	Bogusz, C. I., and Morisse, M. 2018. "How Infrastructures Anchor Open Entrepreneurship: The Case of Bitcoin and Stigma," <i>Information Systems Journal</i> (28:6), pp. 1176-1212.
5	Briel, F. v., Recker, J., and Davidsson, P. 2018. "Not All Digital Venture Ideas Are Created Equal: Implications for Venture Creation Processes," <i>Journal of Strategic Information Systems</i> (27: 4), pp. 278-295.
6	Chan, C. M. L., Teoh, S. Y., Yeow, A., and Pan, G. 2019. "Agility in Responding to Disruptive Digital Innovation: Case Study of a SME," <i>Information Systems Journal</i> (29:2), pp. 436-455.
7	Chanas, S., D.Myers, M., and Hess, T. 2018. "Digital Transformation Strategy Making in Pre-Digital Organizations: The Case of a Financial Services Provider," <i>Journal of Strategic Information Systems</i> .
8	Ciriello, R. F., Richter, A., and Schwabe, G. 2017. "The Paradoxical Effects of Digital Artefacts on Innovation Practices," <i>European Journal of Information Systems</i> .
9	Drnevich, P. L., and Croson, D. C. 2013. "Information Technology and Business-Level Strategy: Toward an Integrated Theoretical Perspective," <i>MIS Quarterly</i> (37:2), pp. 511-536.
10	Du, W. D., Pan, S. L., Zhou, N., and Ouyang, T. 2018. "From a Marketplace of Electronics to a Digital Entrepreneurial Ecosystem (Dee): The Emergence of a Meta-Organization in Zhongguancun, China," <i>Information Systems Journal</i> (28:6), pp. 1158-1175.
11	Feller, J., Finnegan, P., and Nilsson, O. 2011. "Open Innovation and Public Administration: Transformational Typologies and Business Model Impacts," <i>European Journal of Information Systems</i> (20:3), pp. 358–374.
12	Feng, Y., Guo, Z., and Chiang, W.-Y. K. 2009. "Optimal Digital Content Distribution Strategy in the Presence of Consumer-to-Consumer Channel," <i>Journal of Management Information Systems</i> (25:4), pp. 241-270.
13	Gregory, R. W., Keil, M., Muntermann, J., and Mähring, M. 2010. "Paradoxes and the Nature of Ambidexterity in It Transformation Programs," <i>Information Systems Research</i> (26:1), pp. 57-80.
14	Hanelt, A., Busse, S., and Kolbe, L. M. 2017. "Driving Business Transformation toward Sustainability: Exploring the Impact of Supporting Is on the Performance Contribution of Eco-Innovations," <i>Information Systems Journal</i> (27:4), pp. 463-502.
15	Iivari, N., Kinnula, M., Molin-Juustila, T., and Kuure, L. 2018. "Exclusions in Social Inclusion Projects: Struggles in Involving Children in Digital Technology Development," <i>Information Systems Journal</i> (28:6), pp. 1020-1048.
16	Jarvenpaa, S., and Standaert, W. 2018. "Digital Probes as Opening Possibilities of Generativity," <i>Journal of the Association for Information Systems</i> (19:10), pp. 982-1000.
17	Jonsson, K., Mathiassen, L., and Holmström, J. 2018. "Representation and Mediation in Digitalized Work: Evidence from Maintenance of Mining Machinery," <i>Journal of Information Technology</i> (33:3), pp. 216–232.
18	Klecun, E. 2016. "Transforming Healthcare: Policy Discourses of It and Patient-Centred Care," <i>European Journal of Information Systems</i> (25:1), pp. 64–76.

#	Selected paper
19	Leischnig, A., Woelfl, S., and Ivens, B. S. 2016. "When Does Digital Business Strategy Matter to Market Performance?" in: ICIS. Dublin.
20	Leischnig, A., Wölfl, S., Ivens, B., and Hein, D. 2017. "From Digital Business Strategy to Market Performance: Insights into Key Concepts and Processes," in: ICIS. South Korea.
21	Li, L., Su, F., and Zhang, W. 2017. "Digital Transformation by Sme Entrepreneurs: A Capability Perspective," <i>Information Systems Journal</i> (28), pp. 1129-1157.
22	Li, W., Liu, K., Belitski, M., Ghobadian, A., and O'Regan, N. 2016. "E-Leadership through Strategic Alignment: An Empirical Study of Small- and Mediumsized Enterprises in the Digital Age," <i>Journal of Information Technology</i> (31), pp. 185–206.
23	Lucas, H. C., and MeinGoh, J. 2009. "Disruptive Technology: How Kodak Missed the Digital Photography Revolution," <i>Journal of Strategic Information Systems</i> (18:1), pp. 46-55.
24	Lyytinen, K., Yoo, Y., and Boland, R. J. 2016. "Digital Product Innovation within Four Classes of Innovation Networks," <i>Information Systems Journal</i> (26), pp. 47–75.
25	Mithas, S., Tafti, A., and Mitchell, W. 2013. "How a Firm's Competitive Environment and Digital Strategic Posture Influence Digital Business Strategy," <i>MIS Quarterly</i> (37:2), pp. 511-536.
26	Nwankpa, J. K., and Datta, P. 2017. "Balancing Exploration and Exploitation of It Resources: The Influence of Digital Business Intensity on Perceived Organizational Performance," <i>European Journal of Information Systems</i> (26:5), pp. 469–488.
27	Oestreicher-Singer, G., and Zalmanson, L. 2013. "Content or Community? A Digital Business Strategy for Content Providers in the Social Age," <i>MIS Quarterly</i> (37:2), pp. 591-616.
28	Onay, C., Özdiñç, G., and Çavuşyan, S. 2018. "Digital Transformation: A Mutual Understanding and Strategic Alignment Perspective," in: ICIS. San Francisco.
29	Pagani M (2013) Digital business strategy and value creation: Framing the dynamic cycle of control points. <i>MIS Q</i> 37:617–632
30	Rojas, M. G. A., Khuntia, J., Saldanha, T. J. V., Kathuria, A., and Krishnan, M. S. 2016. "Growth Oriented Digital Strategy and Longterm Compensation of Chief Executives," in: ICIS. Dublin.
31	Ross, J. W., Sebastian, I. M., Beath, C., Moloney, K. G., Mocker, M., and Fonstad, N. O. 2016. "Designing and Executing Digital Strategies," in: ICIS. Dublin.
32	Sandberg, J., Mathiassen, L., and Napier, N. 2014. "Digital Options Theory for It Capability Investment," <i>Journal of the Association for Information Systems</i> (15:7), pp. 422-453.
33	Sandeep, M. S., and Ravishankar, M. N. 2018. "Sociocultural Transitions and Developmental Impacts in the Digital Economy of Impact Sourcing," <i>Information Systems Journal</i> (28:3), pp. 563-586.
34	Schreieck, M., Wiesche, M., and Krcmar, H. 2017. "The Platform Owner's Challenge to Capture Value– Insights from a Business-to-Business It Platform," in: ICIS. South Korea.
35	Seo, D. 2017. "Digital Business Convergence and Emerging Contested Fields: A Conceptual Framework," <i>Journal of the Association for Information Systems</i> (18:10), pp. 687 – 702.
36	Setia, P., Setia, P., Venkatesh, V., and Joglekar, S. 2013. "Leveraging Digital Technologies: How Information Quality Leads to Localized Capabilities and Customer Service Performance," <i>MIS Quarterly</i> (37:2), pp. 565-590.
37	Svahn, F., Mathiassen, L., and Lindgren, R. 2017. "Embracing Digital Innovation in Incumbent Firms: How Volvo Cars Managed Competing Concerns," <i>MIS Quarterly</i> (41:1), pp. 239-253.
38	Tilson, D., Lyytinen, K., and Sørensen, C. 2010. "Digital Infrastructures: The Missing Is Research Agenda," <i>Information Systems Research</i> (21:4), pp. 748–759.
39	Tim, Y., Pan, S. L., and Fauzi, S. B. A. 2018. "Digitally Enabled Affordances for Community-Driven Environmental Movement in Rural Malaysia," <i>Information Systems Journal</i> (28:1), pp. 48-75.
40	Tumbas, S., Berente, N., and Brocke, J. v. 2018. "Digital Innovation and Institutional Entrepreneurship: Chief Digital Officer Perspectives of Their Emerging Role," <i>Journal of Information Technology</i> (33:3), pp. 188-202.
41	Whelan, E., Golden, W., and Donnellan, B. 2013. "Digitising the R&D Social Network: Revisiting the Technological Gatekeeper," <i>Information Systems Journal</i> (23:3), pp. 197-218.
42	Woodard, C. J., Ramasubbu, N., Tschang, F. T., and Sambamurthy, V. 2013. "Design Capital and Design Moves: The Logic of Digital Business Strategy," <i>MIS Quarterly</i> (37:2), pp. 537-564.
43	Yeow, A., Soh, C., and Hansen, R. 2018. "Aligning with New Digital Strategy: A Dynamic Capabilities Approach," <i>Journal of Strategic Information Systems</i> (27), pp. 43–58.

Table A-2. Selected Papers

#	Coding: Dimensions/issues	Reference (selected papers)
1	Digital strategy and IT/IS strategy	Bogusz and Morisse 2018; Chantias et al. 2018; Drnevich and Croson 2013; Mithas et al. 2013; Oestreicher-Singer and Zalmanson 2013; Ross et al. 2016; Sandberg et al. 2014; Seo 2017; Tilson et al. 2010; Tumbas et al. 2018; Woodard et al. 2013

#	Coding: Dimensions/issues	Reference (selected papers)
2	Digital strategy environment	Bharadwaj et al., 2013; Hanelt et al. 2017; Jarvenpaa and Standaert 2018; Mithas et al. 2013; Tim et al. 2018; Woodard et al. 2013; Feller et al., 2011; Klecun, 2016
3	Vision to establishing digital strategy	Hanelt et al., 2017; Leischnig et al. 2016; Li et al. 2017; Ross et al. 2016; Tim et al. 2018; Feller et al., 2011; Pagani, 2013
4	Approach to establishing digital strategy	Berghaus & Back, 2017; Bharadwaj et al. 2013; Chanias et al. 2018; Lyytinen et al. 2016; Mithas et al. 2013; Oestreicher-Singer and Zalmanson 2013; Seo 2017; Woodard et al. 2013; Whelan et al., 2013
5	Digital strategy stakeholders	Baird and Raghu 2015; Ciriello et al. 2017; Li et al. 2016; Lucas and MeinGoh 2009; Tumbas et al. 2018; Feller et al., 2011; Feng et al., 2009; Nwankpa & Datta, 2017; Andrade Rojas et al., 2016
6	Digital strategy capability	Leischnig et al., 2017); Li et al. 2017; Ross et al. 2016; Sandberg et al. 2014; Setia et al. 2013; Nwankpa & Datta, 2017
7	Digital strategy challenges and response to those challenges	Berghaus & Back, 2017; Chan et al. 2019; Gregory et al. 2010; Ross et al. 2016; Svahn et al. 2017; Yeow et al. 2018; Bharadwaj et al. 2013; Chan et al. 2019; Hanelt et al., 2017; Leischnig et al., 2017; Lyytinen et al. 2016; Sandberg et al. 2014; Sandeep and Ravishankar 2018; Tim et al. 2018; Yeow et al. 2018; Feng et al., 2009; Klecun, 2016; Nwankpa & Datta, 2017; Cavusyan et al., 2018
8	Digital strategy for established companies	Bharadwaj et al. 2013; Bogusz and Morisse 2018; Briel et al. 2018; Du et al. 2018; Iivari et al. 2018; Jonsson et al. 2018; Schreieck et al. 2017; Svahn et al. 2017; Nwankpa & Datta, 2017; Whelan et al., 2013

Table A-3. Sample of Coding Dimensions and the Selected Papers

Appendix B. Course Syllabus

University of <Name>
Department of <Name>

COURSE SYLLABUS
Digital Strategy
<Course Code>

135 hours ~ 5 ECTS (European Credit Transfer and Accumulation System)
Semester [Spring/Fall], <Year>

Instructor (s): <Name(s)>
Email: <Email>, Phone: <Phone>>
Visiting hours: <Time>
Office: <Address>
Course key for the course's learning platform: <Code>

1. Prerequisites

None. However, this course is intended at the master's level.

2. Course Description

This course emphasizes insight into digital strategy, IT/IS strategy and dimensions of digital strategy, both theoretical and practical, and gives you practice in developing a digital strategy. It is specifically designed to allow students to create a digital strategy for the clients. The course involves Problem-Based Learning (PBL) with a constructivist approach to student-centered education. It is also applied, activity-based collaboration (PBL groups) and therefore relies heavily on both an individual and a team approach to learning. The course is guided by instructors and/or mentors/experts who act as cognitive coaches, and you develop problem-solving, critical thinking, and collaborative skills.

3. Course Objectives

Upon satisfactory completion of this course, students should be able to: Understand the importance of digital strategy in the digital world; Understand fundamental digital strategy dimensions and their examples; Analyze and evaluate practical and scientific material; Analyze and evaluate both technical and business perspectives of a digital strategy in its context; Develop basic skills in the topic of digital strategy (e.g., interpersonal skills, context analysis, digital strategy's dimensions analysis, organization, technology, and problem-solving skills); Collaborate with stakeholders from different disciplines and the clients to create a digital strategy relevant to the client's context.

4. Time Allocation

Course is based on the lectures, the seminar, the project work and written assignments. Location: <Name>. There is no examination on this course.

Lectures	20 h	Project work	70 h
Seminars	15 h	Write and present reports	20 h
Individual work	10 h	Total 5 ETCS =	135 h

5. Instructional Methods

During this semester, you will work with four to five other students to complete a major digital strategy project in collaboration with different stakeholders. This course will challenge you to find ways of working efficiently with stakeholders to create or refine a digital strategy for the client. You should be prepared to meet with your client, your collaborative stakeholders and group outside of regular class hours.

The instructor and/or mentors can also spend some time discussing topics and theories that relate to your work in progress, but the amount and nature of that discussion will depend on what you need to know to complete the assigned work. Part of your responsibility in this course is to identify issues/topics you want us to explain and discuss. As a result, the instructional methods involve direct instruction, interactive instruction, independent study, and experiential learning.

6. Course Materials and Course Website

Assigned reading materials should be read prior to class. Class lectures, seminars and discussions will proceed with supplemental and advanced topics, which could be difficult to understand unless you have read the assigned material. Readings are listed in the schedule section. All necessary updates and/or changes to the course will be reflected on the course website.

We will be using the University-supported system (e.g., learning platforms) called <Platform Name> to distribute information about the course. You will be able to use <Platform Name> to access the syllabus and calendar, read announcements, do quizzes, perform self- or peer-assessments, check the grading criteria for each assignment, check your grades for those assignments, and post questions and answers. To get started, go to <course website> with <course key> and follow the instructions for logging in and accessing class information. Please make a regular habit of checking the <course website> for this class because all course announcements will appear there! It is your responsibility to be informed of whatever is posted.

- Required textbook: To be determined
- Required readings: Additional required readings will be assigned during the semester. These readings will consist of electronic articles, book chapters, and documents.
- Additional materials: Handouts, and supplemental materials

7. Rules of the Road

All the tasks need to be completed within the given deadlines. Also, if you have a justifiable reason (e.g., certificates from a doctor) and you have an agreement well in advance with the instructor. Deadlines in those cases will be flexible.

Policies related to studies at the University should be followed including ethical guidelines. All reports are checked by <Plagiarism Name> software. Students are encouraged to collaborate by helping each other in class and in doing assignments. However, students are expected to do their own work. Copying another student's work or answers will result in a zero grade for the course.

The majority of the learning activities are working in a group. Thus, collaborators must learn to negotiate and compromise in the best interests of the group and the achievement of the team's goal. You must agree to cooperate with each other and should assign responsibilities at the outset. If a team member isn't fulfilling his or her responsibilities, work as a group to encourage that person to participate. If you don't succeed, one option is to make an appointment for the team to ask the instructor to mediate.

8. Attendance

Attendance is mandatory. The instructor explains assignments in class, hands out related materials, and discusses and clarifies assigned readings. Much in-class time will be spent working within groups on the collaborative project. Missing class during that time will hurt not only you, but your group as well. If students miss a class, you're still responsible for any assignments and materials presented in class.

9. Assessment/Grade

In order to successfully pass the course, students will be expected to complete the activities listed below. Weights indicate the contribution to the final course grade.

Attendance, quizzes, in-class activities, and learning diaries (20%): This component of the final grade is based on your contribution to the class in the form of the mentioned parts. Unannounced quizzes may be given during the semester.

Seminar reports (20%): This component of the final grade is based on reading and critiquing cases study and papers.

Project reports (60%): This component of the final grade is based on a group project in which students will work in small teams of five to six people to create a digital strategy featuring the needs of the client to solve a real-world problem or create a new business model. Project will be graded based on assessment rubrics and outcomes-based assessment.

Grading Scale is shown in Table 2-1 follows.

Grading Scale	Interpretation
90-100% 5	Excellent, exceeds average understanding as evidenced in course work and goes well beyond the basics.
80-89% 4	Good, fully meets average understanding.
70-79% 3	Average, meet minimum expectations and satisfies course requirements.
60-69% 2	Below average, meet minimum expectations and satisfies all or most of the course requirements.
0-59% F	Fails to meet minimum expectations in understanding and course.

Table B-1. Grading Scale and Its Interpretation

10. Main Content

The course calendar can be found in Table 2-2 as follows. This is a preliminary schedule and it may change due to class needs and the client's needs.

One of the main parts of the course is the project work. The project will give students experience working as a member of a team to create a digital strategy for the client. To achieve this goal, you have to identify a problem or an issue and then create a solution related to digital strategy and its dimensions. You also have to reach a consensus about the objectives of your project and the purpose of your study, you then develop a project plan that will actively and equally involve all team members. Ultimately, you produce a report that accurately reflects the views of the team and achieves the objectives identified at the project's outset and meets the client's needs. In addition, you'll gain experience in project planning, time management, group dynamics, problem-solving, and decision-making.

The client's employees, mentors, instructors, and students frequently work together on projects. Under the leadership of a project supervisor or a project manager, members of a team may engage in various kinds of work: investigate problems and solutions; gather and evaluate the business environment, vision, capability, stakeholders; design artifacts; and test and evaluate artifacts (e.g., products, policies, and procedures). They keep careful records of their activities, assign team members specific tasks, and in the end, produce a report, or manual. The resulting document represents the collaborative efforts of all project team members. Its quality reflects not only the competence of the individuals involved, but their combined ability to manage a project, set and meet deadlines, and carry a document through all essential stages of the process.

Session*	Topic or Activities	Reading or Preparation	Assignment Due, type	Assessment methods
1	Course introduction; Features of IS/IT strategy; Concept of digital strategy; and introduction to semester project P1	Scientific Papers listed in Table A3, #1	Quiz 1 (in class), individual	Self-assessment, self-assessment matrix is expected
2	Digital strategy dimensions P1: Digital strategy environment, and vision in establishing a digital strategy	Scientific Papers listed in Table A3, #2, and #3	Learning diary 1, individual	Peer and formative assessment
3	Workshop on digital strategy vision with a local case	Case: Local company(s)	Learning diary 2, individual	Peer and formative assessment
4	Digital Technologies in Digital Strategy	Companies and their history are mentioned in Table 1	Workshop report 1, team	Formative assessment

Session*	Topic or Activities	Reading or Preparation	Assignment Due, type	Assessment methods
5	Digital strategy dimensions P2: Approaches to establishing digital strategy, and digital strategy capability	Scientific Papers listed in Table A3, #4, and #5	Quiz 2 (in class), individual	Self- and formative assessment
6	Workshop on resources and approaches for digital transformation	Case Local company(s)	Learning diary 3, individual	Formative assessment
7	Digital strategy in born digital technological company and established company	Papers and cases that have been provided to this date	Workshop report 2, team	Peer and formative assessment
8	Digital strategy dimensions P3: Digital strategy stakeholders, and digital strategy challenges	Scientific Papers listed in Table A3, #5, and #6	Quiz 3 (in class), individual	Self- and formative assessment
9	Digital strategy challenges and solutions	Papers and cases that have been provided to this date	Learning diary 4, individual	Formative assessment
10	Introduction to semester project P2: The client presents their needs/issues related to digital strategy	The client's profile and documents	Personal and team profile; Workshop report 3, team	Formative assessment
11	The client and the students discuss in depth the problems that the client presented in the previous session.		#	
12	Project: Proposing digital strategy workshop <i>The instructor, the stakeholder and the client work with each group</i>		Initial plan for creating a digital strategy, team	Formative assessment
13	Project: feasibility, quick review and planning digital strategy <i>The instructor, the stakeholder and the client work with each group</i>		Proposal draft of the digital strategy, team	Formative assessment
14	Project: Creating a digital strategy <i>The instructor, the stakeholder and the client work with each group</i>		Planning and feasibility report, team	Formative assessment
15	Project: Review of feasibility report, planning report and final report <i>The instructor, the stakeholder and the client work with each group</i>		Quiz 4, individual	Self-, group- and formative assessment
16	Oral reports Oral reports; evaluations		digital strategy draft, team	Summative assessment (e.g., assessment rubrics and outcomes-based are expected)
17	Group Wrap-up + Individual and Team Evaluations		Completion of digital strategy, team	Summative assessment (e.g., assessment rubrics and outcomes-based are expected)

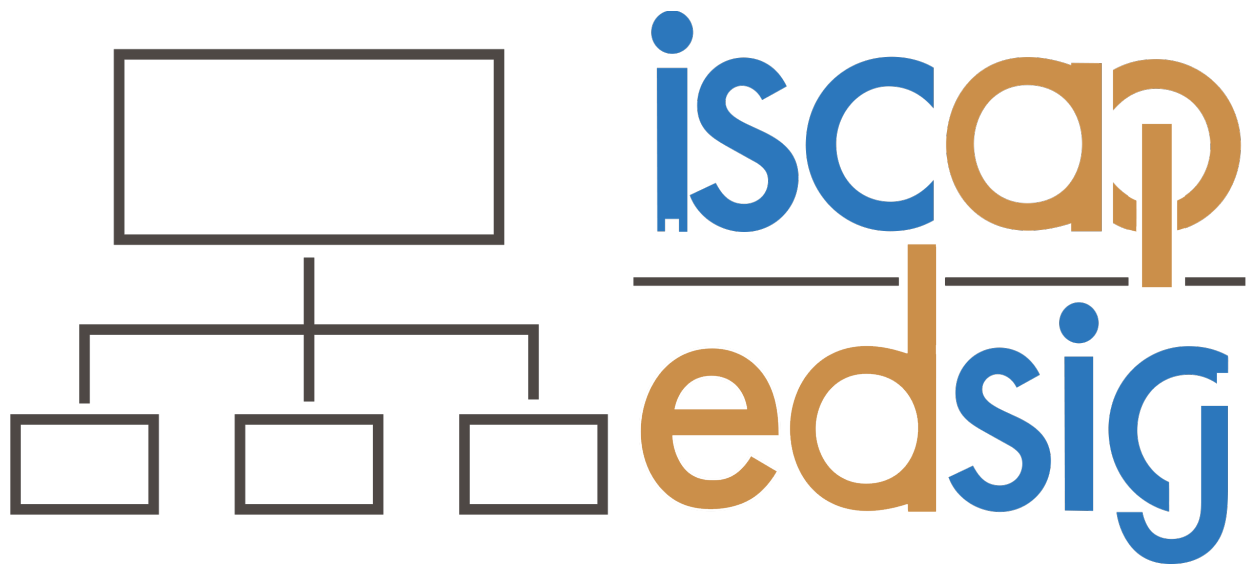
*Lectures (Session 1, 2, 5, and 8); Seminars (Session 4, 6, and 9); Individual work (Session 3, and 6); Project work (Session 1, 10, 11, 12, 13, 14, 15, 16, and 17); Write and present reports (Session 4, 7, 10, 16, and 17).

Table B-2. Preliminary Course Calendar

Appendix B's References

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