HOW DIGITAL IS SOCIAL? TAKING ADVANTAGE OF DIGITAL FOR SOCIAL PURPOSES

Research paper

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Abstract

Today's customers are highly aware of and sensitive to social topics. Thus, they expect organizations across all industries not only to avoid social inequalities but to react with distinct actions against social inequalities, i.e. to strive for social innovation. Moreover, digital technologies can help to leverage social innovation more easily. There are already first examples of incumbents fostering digital social innovation. Merck, for example, introduced a sticking plaster with sensors to support diabetes patients in analysing their intestinal fluids without injection. Although the potentials of digital technologies in addressing social issues seem to be obvious, research on digital social innovation is still in its infancy, and clear guidance on how to exploit the potential of digital social innovation is missing. As such, a common understanding in terms of theoretical and managerial implications is scarce. We propose a taxonomy in order to structure the research field and provide incumbents with a tool on how to address their social responsibility through digital social innovation. Thus, our study contributes to descriptive knowledge and delivers insights relevant to the practice of digital social innovation.

Keywords: Social Innovation, Digital Innovation, Digital Social Innovation, Taxonomy.

1 Introduction

Digitalization connects societies and individuals worldwide and accelerates the exchange of information between them (Gimpel and Röglinger, 2015). Subsequently, social issues like extreme poverty, climate change, or gender inequality are able to attract ever more awareness and sensitivity among all people (United Nations, 2015; Grigore et al., 2017). Recent examples show, digital technologies take a crucial role in spreading the voice of an individual about social deficiencies leading to worldwide movements. Enabled through social media posts going viral (Fridays For Future, 2019a), the movement "Fridays For Future" unites millions of people protesting for global climate (Fridays For Future, 2019b). Amplifying the need for social awareness and responsibility towards social issues, the UN defined 17 Social Development Goals (SDGs) in 2015 (United Nations, 2015) in the overall context of people, planet, prosperity, peace, and partnerships (United Nations, 2015; Wu et al., 2018). As individuals become more sensitive towards social issues, organizations need to act along these SDGs in order to address changing customer demands (Porter and Kramer, 2006).

In a context which is characterized by globalization, technological advancement, and changing customer behaviours (Vrontis and Alkis, 2013), innovation is crucial for organizations to maintain their competitive advantage (Cooper and Kleinschmidt, 1993; Bresciani, 2010). Considering the rising awareness of social responsibility (Porter and Kramer, 2006), incumbents, i.e. established, market-leading companies drawing on longstanding business models (MacMillan and Selden, 2008), develop social innovation supported with digital technology (DT) (Onsongo, 2019). For instance, Vodafone and its subsidiary Safaricom developed M-Pesa, a banking opportunity for the unbanked population of Kenya. By building on existing DTs, M-Pesa offers the population a banking service without the need for additional (digital) infrastructure. After the implementation of M-Pesa, the company's revenues rose to 100 million USD (Onsongo, 2019). This represents an impressive example of a business idea aimed at doing good – solving social issues with a valid and self-sustained business model.

Apart from direct revenue, social innovation (SI) holds various potentials for incumbents in terms of indirect revenue, e.g. through employee satisfaction or customer loyalty. For one thing, employees who voluntarily engage in a company's social activities are more satisfied (Vinerean et al., 2013). It strengthens their identification with their employer, which in turn results in a higher intention to stay with the incumbent (Jones, 2010). For another thing, customers base their consumer decisions on brands (Beckmann, 2007). Consequently, developing a positive reputation becomes more important, as its returns raise the company's stock-value (Porter and Kramer, 2006).

Research on SI has grown substantially. Social entrepreneurship, which is defined as "entrepreneurial activity with an embedded social purpose" (Austin et al., 2006, p.1), is a contested concept with research going back more than two decades (Austin et al., 2006; Choi and Majumdar, 2014). Yet the SI discussion is limited and so far focusses on doing-good-for-society (Osburg, 2013). Thus, SI needs a greater link to corporate innovation in order to unfold its full potential (Osburg, 2013). With the support of DTs, SI can have an even higher impact (Morrar et al., 2017). The Information Systems (IS) discipline recognizes this trend and integrates social topics into future research agendas and calls for more corporate actions (Watson et al., 2010; Walsham, 2012). Tracey and Stott (2017) state that a future research agenda should be to explore the potentials of DTs in SIs, also known under the term digital social innovation (DSI). Although research has grown substantially, the topic of DSI is still fragmented and not yet fully defined (Halpin and Bria, 2015). As such, a common understanding in terms of theoretical and managerial implications is missing. Specifically, research and practice lack structure on how to make the best use of DTs to address social issues (Halpin and Bria, 2015). In order to support incumbents addressing the full potential of DSI, research needs to provide clear guidance (Tracey and Stott, 2017). Hence, disciplines like IS and SI should be connected to create an overall concept for DSI. Thus, we address this gap with the following research question: *What are crucial elements of DSI in the context of incumbents?*

We develop a taxonomy (Nickerson et al., 2013) to structure the research field of DSI and provide a tool on how to address future social issues with the help of DTs. We derive the structure of our taxonomy

deductively from literature, building on the streams SI, digital innovation (DI), and DSI. The proposed dimensions are Agent, Direction, Objective, Payoff, Target, Role of Digital Technology, and Outcome. The dimensions deliver insights for researchers and practitioners to better understand the topic and therefore support future decision-making. The paper is a first step toward comprehensively conceptualizing DSI and integrating SI into IS research. Further, we provide an approach for organizations to structure and assess their possibilities in regard to DSI. Thus, our taxonomy serves as the necessary groundwork for purposeful decisions in the innovation process.

The paper is structured as follows: In Section 2 we propose definitions and overviews of the topics of DI, SI, and DSI, followed by the description of the taxonomy development method according to Nickerson et al. (2013) in Section 3. In Section 4, we present the developed taxonomy by an explanation of its dimensions and characteristics. The demonstration of the taxonomy and the conclusion are given in Sections 5 and 6.

2 Theoretical Foundations

2.1 Digital Innovation

Innovation's place in the business environment dates back to 1934, when Schumpeter defined it as the recombination of organizations' assets and skills for competitive differentiation (Schumpeter, 1934). Yoo et al. (2010, p. 725) transfer this perspective to DI and define it as "new combinations of digital and physical components". Therefore, a main component of DI is the use of DTs to enable or support (Benbasat and Zmud, 2003). Researchers define innovation in general, and DI in particular, not only as creating new products (Fichman et al., 2014; Nambisan et al., 2017). Nambisan et al. (2017) define DI as the creation of new products, processes, and principles. Others argue that DI is the creation of new products, processes, and business models (Fichman et al., 2014). We focus on the objective of innovation, when defining DI as either being exploitative or explorative. Therefore, DI can either be exploitative and meet the needs of existing markets and existing customers, or DI can explore the potentials of new markets and new customers (Benner and Tushman, 2003; Vrontis et al., 2017).

DTs, being a part of DI, can be understood as an architecture consisting of four different layers: content, network, service, or device (Yoo et al., 2010). The content layer refers to information as digital data like music or news articles, whereas the service layer includes functional software-based resources (e.g. social media applications) (Henfridsson et al., 2018). A network "includes logical transmission software and the physical transport resources" (Henfridsson et al., 2018, p. 94), and the device layer "consists of hardware and software resources that enable storing and processing capabilities" (Henfridsson et al., 2018, p. 94). DTs and digital services are part of the everyday life of individuals, as they are getting cheaper and provide flexibility, convenience, and interconnectedness. By 2022, there will be more than 50 billion internet-enabled devices (Sorrell, 2018). Hence, the access barrier for internet-enabled devices decreases for all social classes, which leads to entire new market opportunities for incumbents. To sum up, we define DI as either being exploitative or explorative using DTs in a supporting or enabling way. DTs can either be a network, content, service or device, or a combination thereof.

2.2 Digital Social Innovation

SI as a concept is widely used in different research disciplines (Cajaiba-Santana, 2014; Aksoy et al., 2019), e.g. social entrepreneurship, corporate social responsibility (Dias and Partidário, 2019), social intrapreneurship, and social extrapreneurship (Tracey and Stott, 2017). The concept itself especially emerged from 2005 onward (Cajaiba-Santana, 2014; Edwards-Schachter and Wallace, 2017). Several technological, economic, political, and socio-cultural changes, e.g. financial crisis, involuntary unemployment and digitalization triggered the growth of SI as a research field (Edwards-Schachter and Wallace, 2017). However, researchers propose several different definitions for SI and do not yet have a common understanding of the field (Berzin and Pitt-Catsouphes, 2015; Turker and Altuntas Vural, 2017; Eichler and Schwarz, 2019). This can be because the research topic itself is quite new but still fragmented (van der Have and Rubalcaba, 2016; Eichler and Schwarz, 2019). We build on Berzin and Pitt-

Catsouphes (2015, p. 360), who synthesize the perspectives with the common core, defining SI as being "the development and application of new solutions to social problems". SI is also relevant for incumbents, exploiting already available resources (Berzin and Pitt-Catsouphes, 2015). Thus, SI is an essential part of a corporate innovation strategy (Berzin and Pitt-Catsouphes, 2015). Eichler and Schwarz (2019) reviewed several case studies and concluded that SI contains five aspects, namely, the innovative element, implementation and execution, improvement, social need, and relationships and collaborations. SI can be conducted in several contexts, e.g. doing good for people or nature. Hence, most of the examined case studies can be grouped under the 17 SDGs, which are assigned to five categories, namely, people, planet, peace, prosperity, and partnerships (Wu et al., 2018; Eichler and Schwarz, 2019). Building on our definition of innovation in Section 2.1, we define SI as a new solution to social problems, which can be assigned to the 17 SDGs and a respective category (Wu et al., 2018).

Combining both approaches, DI and SI, DSI is a relatively new concept (Halpin and Bria, 2015). With digitalization providing large potentials, e.g. regarding connecting people and exchanging information (Gimpel and Röglinger, 2015), it acts as crucial enabler and supporter for SI. However, there is only little research on it so far. DSI can be defined as "a type of social and collaborative innovation in which innovators, users, and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet" (Bria, 2015, p. 9).

Despite its newness, related practitioner projects emphasize the need for and benefits of DSI. One example for the latter is DSI4EU, whose main aim is to support DSI in Europe. The corresponding website DigitalSocial.eu makes DSI projects transparent, and can be used to explore the DSI community and find funding and support (Nesta, 2019). Another example is the project H2020 SOCRATIC. It is a DSI platform which aims for different stakeholders to share their SI ideas, collaborate with other stakeholders, select the best ideas, and bring them to life (Fundación Cibervoluntarios, 2019). As shown by these projects, DSI is highly relevant in practice and should therefore also be pursued as a research stream to generate contributions for research and practice.

2.3 Leveraging DSI for Incumbents

In line with an individual's raised awareness towards social issues, an incumbent's social responsibility increases (Porter and Kramer, 2006). As incumbents are often conceptualized as social actors, they are evaluated regarding humanlike qualities such as morality (Bauman and Skitka, 2012). Accordingly, incumbents are expected to have a responsibility "to do good" beyond profit making. Social responsibility in the corporate context has gained substantial attention (Grigore et al., 2017). Different streams in this direction are, e.g. corporate social responsibility (Vinerean et al., 2013), corporate entrepreneurship, social intrapreneurship (Hadad and Cantaragiu, 2017), and corporate social innovation (Herrera, 2015). This results in a variety of different research areas which are not necessarily aligned (Cajaiba-Santana, 2014). All of them agree on the positive impact of social initiatives on incumbents. Activities that represent social responsibility influence how individuals, specifically employees and customers, perceive an incumbent. Incumbents associated with a positive reputation have more loyal customers (Barnett, 2007; Bartikowski et al., 2011) and retain highly committed employees (Helm, 2011; Barakat et al., 2016), which both lead to higher financial returns (Chi and Gursoy, 2009; Antoncic and Antoncic, 2011). Hence, SI initiatives fostering a positive reputation open up various potentials. Those initiatives can either be directed towards the organization itself, towards stakeholder engagement, or towards the whole society. To all three, DTs open up opportunities. Regarding the first, DTs increase efficiency, resulting in new sources of profit. Relating to the second, DTs enable new communicative opportunities to engage with key stakeholders. Regarding the latter, DTs support incumbents in actively producing a better society by providing access to information, services, and the sustainability of businesses (Grigore et al., 2017). The high diffusion of DTs with low access barriers leads to a high adoption rate in all classes of society. As such, the field of DSI therefore presents incumbents with extensive opportunities.

3 Methodology

Our aim is to structure the field of DSI and therefore give guidance to incumbents on how they can leverage DTs in their future approaches toward solving social issues. The best way of doing so is to use the tool of taxonomies (Glass and Vessey, 1995). Sometimes used as a synonym for the terms typology or framework, taxonomies help practitioners and researchers to bring order to complex domains, understand them, and analyse them (Nickerson et al., 2013). In the IS discipline, taxonomies are often used to show how different concepts are connected and how they relate to each other (Glass and Vessey, 1995). Although taxonomies are a widely used clustering method in the IS discipline, up to 2013 there had not been a common development method (Lösser et al., 2019). Therefore, Nickerson et al (2013) were the first ones to offer a structured and iterative process for developing taxonomies in the IS discipline. Hence, for developing our taxonomy, we follow the method of Nickerson et al. (2013) and provide an overview of our approach in Figure 1.

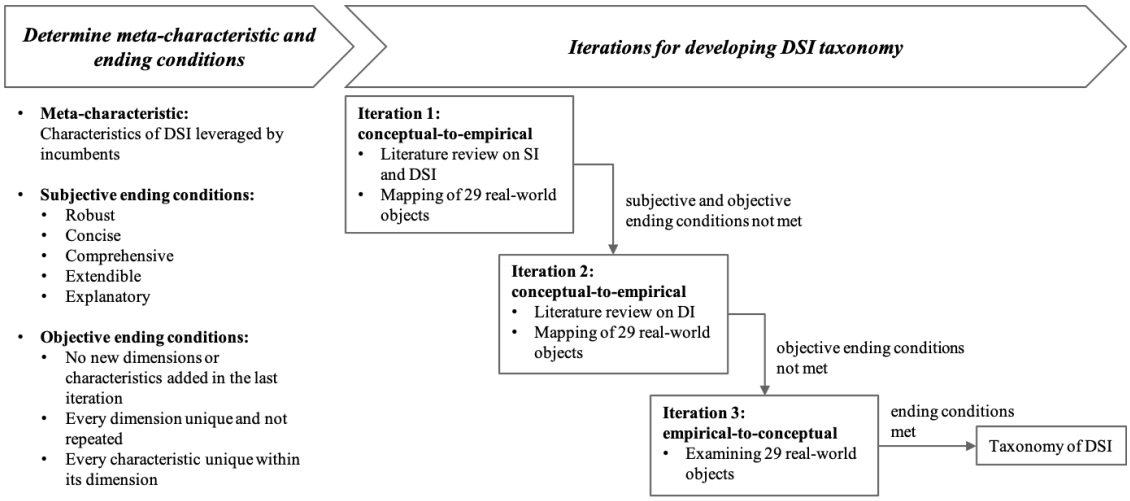

Figure 1. Process of taxonomy development adapted from Nickerson et al. (2013)

Determine meta-characteristic and ending conditions

The first step of the method is to define a meta-characteristic. All characteristics of the developed taxonomy "should be a logical consequence of the meta-characteristic" (Nickerson et al., 2013, p. 8). In accordance to our research question, our meta-characteristic is *characteristics of DSI leveraged by incumbents*. The second step is the definition of objective and subjective ending conditions. The defined ending conditions are checked after each iteration in the taxonomy development process. If they do not all apply to the developed taxonomy, another iteration must follow (Nickerson et al., 2013). Nickerson et al. (2013) propose exemplary objective and subjective ending conditions, stating that their list is not exhaustive. Researchers can decide, what ending conditions they want to apply for their taxonomy (Nickerson et al., 2013). We decided to go in line with the ending conditions proposed by Nickerson et al. (2013), defining the subjective ending conditions as the need for the taxonomy to be robust, comprehensive, concise, extendible, and explanatory. In the pool of objective ending conditions, we decided to apply the following: (1) no new dimensions or characteristics were added in the last iteration, (2) every dimension is unique and not repeated, (3) every characteristic is unique within its dimension (Nickerson et al., 2013). Moreover, according to Nickerson et al. (2013), the derived characteristics must be mutually exclusive and collectively exhaustive. While mapping real-world objects to the developed taxonomy, we noticed that most of the objects cannot be restricted to one characteristic per dimension, as relevant information would go missing. Therefore, we go in line with other publications (Püschel et al., 2016; Jöhnk et al., 2017; Berger et al., 2018) and allow for a non-exclusivity.

After defining the meta-characteristic and the subjective and objective ending conditions, the taxonomy development iterations start either with a conceptual-to-empirical or an empirical-to-conceptual approach. Nickerson et al. (2013) allow these approaches to be mixed between different iterations. They advise to start with a conceptual-to-empirical approach when researchers have a good understanding of

the underlying research field but little available data. Researchers therefore are able to derive dimensions and objects based on their creativity and justificatory knowledge, followed by mapping real-world objects to the developed taxonomy. Starting with the empirical-to-conceptual approach, on the other hand, is advised when researchers have a large set of objects at hand, but little knowledge about the research discipline. Dimensions and characteristics are then derived by studying the objects in detail (Nickerson et al., 2013). In order to create the taxonomy, we conducted three iterations (Figure 1).

Iteration 1: conceptual-to-empirical

To gain a grounded theoretical understanding of the examined research area of DSI, we started developing the taxonomy using the conceptual-to-empirical approach (Webster and Watson, 2002; Levy and Ellis, 2006). This is appropriate as, to the best of our knowledge, there is no structured knowledge on the new field of DSI so far. Therefore, the literature review helps structure existing knowledge on SI and DI in order to build the taxonomy. The literature is searched in a structured way (Webster and Watson, 2002; vom Brocke et al., 2009; vom Brocke et al., 2015), following a five-step approach: (1) define a search protocol, (2) search the literature, (3) refine the search results, (4) summarize the findings, (5) disseminate the results (Boell and Cecez-Kecmanovic, 2015). Regarding Step 1, we defined the search terms and databases as well as inclusion and exclusion criteria in our search protocol, all in line with our research question (Boell and Cecez-Kecmanovic, 2015; vom Brocke et al., 2015). We decided to conduct the literature search using the Web of Science (WoS) Core Collection, as it includes articles from different disciplines, which are peer-reviewed to ensure high quality (Web of Science Group, 2019). Moreover, different WoS categories were selected, whereas others were explicitly excluded. The searched categories for the different iterations are shown in Table 1. Additionally, we restricted the search results to the search string being part of the title. Both measures enabled a more targeted search but still wide enough to ensure the interdisciplinarity of the resulting publications. We defined exclusion and inclusion criteria for the papers (Boell and Cecez-Kecmanovic, 2015). Papers were included for further investigation when the paper contained some kind of model or framework, when it was a literature review or a case study examining specific DSI examples, or when the topic of the paper was explicitly mapped to the corporate context. Moreover, search results were explicitly excluded when the result was a book review, an introduction to a special issue, or when the paper was neither in English nor in German.

WoS categories for "Social Innovation"	WoS categories for "Digital Innovation"
Management, Business, Economics, Environmental Studies, Social Sciences Interdisciplinary, Social Work, Sociology, Computer Science Information Systems, Environmental Sciences, Social Issues, Computer Science Interdisciplinary Applications, Green Sustainable Science Technology, Development Studies, Multidisciplinary Sciences, Behavioral Sciences, Ethics, Engineering Environmental, International Relations	Management, Computer Science Information Systems, Business, Computer Science Interdisciplinary Applications, Economics, Development Studies, Environmental Sciences, Environmental Studies, Green Sustainable Science Technology, Social Issues, Social Sciences Interdisciplinary, Multidisciplinary Sciences, Engineering Environmental

Table 1. WoS categories per search string, sorted by citations

For our first iteration, we used the search string "Social Innovation", which also included results for "Digital Social Innovation". After conducting the search based on the criteria defined in the search protocol, the next step is to refine the search results (Boell and Cecez-Kecmanovic, 2015). First, the title and the abstract of the respective papers were scanned based on the inclusion and exclusion criteria above (vom Brocke et al., 2015). Of the initial set of 564 search results, 170 papers were included for a second scan. This was done by reading the introduction, applying the same inclusion and exclusion criteria, leading to a refined list of 47 papers. The papers in the refined list were then ranked from 1 (paper most relevant to the research) to 4 (paper least relevant to the research). Excluding rank 3 and 4 to ensure a topic-specific final pool of papers, the final list contained 22 papers that have been analysed in full. Moreover, papers were added through conducting puncturing forward and backward searches (Webster and Watson, 2002). In total, the following 12 papers were considered for our taxonomy in

Step 4: Benner and Tushman (2003), Dawson and Daniel (2010), Gaynor (2013), Boelman et al. (2014), Sanzo et al. (2015), United Nations (2015), Vrontis et al. (2017), Eichler and Schwarz (2019), Wu et al. (2018), Caroli et al. (2018), Baptista et al. (2019), Phillips et al. (2019). Step 5 concluded with disseminating the results. Based on this first set of literature, we developed a first iteration of the taxonomy. The developed taxonomy, i.e. its dimensions and characteristics, was then challenged by mapping real-world objects to it (Nickerson et al., 2013). This is done in order to validate whether the dimensions and characteristics represent the characteristics of real-world objects (Oberländer et al., 2018). The process of creating the pool of real-world objects is described in detail in Section 5.1. By checking the ending conditions, it became apparent that the developed taxonomy was not *comprehensive*, as it did not include a digital component. Moreover, the objective ending condition of *no new dimensions or characteristics were added in the last iteration* was not met. Therefore, the second iteration followed.

Iteration 2: conceptual-to-empirical

In the second iteration, we followed another conceptual-to-empirical approach. However, this time the systematic literature review was done by using the search string "Digital Innovation". We repeated the procedure of conducting the structured literature review explained as above. Starting with 62 papers, the final pool of papers considered for our taxonomy was a total of four: Benbasat and Zmud (2003), Yoo et al. (2010), Nambisan et al. (2017), Henfridsson et al. (2018). The taxonomy was refined, ending with mapping the same set of real-world objects as in Iteration 1. As described above, the chosen categories in the WoS database can be seen in Table 1. Since new dimensions and characteristics were added in this iteration, not all ending conditions applied (cf. Figure 1). As such, the third iteration followed.

Iteration 3: empirical-to-conceptual

The third and last iteration followed an empirical-to-conceptual approach examining 29 different real-world objects. As stated before, they were also used to map to the taxonomy in Iteration 1 and 2. This time the objects were examined in detail, looking for similarities and differences (Nickerson et al., 2013). No new dimensions and characteristics were added. Moreover, there were no duplications of dimensions and of characteristics within a dimension. Furthermore, all authors checked the subjective ending conditions separately by having a close look at the developed taxonomy and its elements with the help of the guiding questions provided by Nickerson et al. (2013). To give an example of the latter, the guiding question for conciseness is to assess whether "the number of dimensions allow the taxonomy to be meaningful without being unwieldy or overwhelming" (Nickerson et al., p. 9). This can be combined with the objective criteria of a taxonomy not to have less than five and more than nine dimensions (Miller, 1956). Our taxonomy has a total of seven dimensions, therefore the ending condition is met. The other subjective ending conditions were checked in the same way, with no one recommending a change in elements. Therefore, the authors all agreed that the taxonomy was concise, robust, comprehensive, extendible, and explanatory, leading to all objective and subjective ending conditions being met. We present the final taxonomy in the next section including an explanation of the compiled dimensions and characteristics.

4 A Taxonomy for Digital Social Innovation

In this section, we present our final taxonomy and explain the corresponding dimensions and characteristics in detail, structuring the new field of DSI. As DSI is a new field, the taxonomy combined the literature of SI and DI, respectively. In the first iteration, the taxonomy builds on literature on SI through conducting a systematic literature review. In the second iteration, we enhanced the taxonomy with digital specifics based on literature on DI. Figure 2 shows the taxonomy, which consists of seven dimensions. In the first iteration of the taxonomy development, the dimensions "Agent" (Sanzo et al., 2015; Caroli et al., 2018; Phillips et al., 2019), "Direction" (Gaynor, 2013; Boelman et al., 2014), "Objective" (Benner and Tushman, 2003; Vrontis et al., 2017), "Payoff" (Dawson and Daniel, 2010; Baptista et al., 2019), and "Target" (United Nations, 2015; Eichler and Schwarz, 2019; Wu et al., 2018) with their respective characteristics were derived, framing the scope of the taxonomy regarding SI. In the second iteration, the digital dimensions "Role of Digital Technology" (Benbasat and Zmud, 2003; Nambisan et al., 2017) and "Outcome" (Yoo et al., 2010; Henfridsson et al., 2018) were added. In doing so, the

taxonomy for DSI was complemented. Every dimension is described in detail in form of a question, which is supposed to be answered through the respective dimension and its characteristics.

DIMENSION	CHARACTERISTICS					DESCRIPTION
Agent	Isolated	With Partners	Through Partners			In what cooperation setting is the incumbent innovating?
Direction	Top-Down	Bottom-Up				From which direction is the innovation being initiated?
Objective	Exploration	Exploitation				What is the objective of the innovation?
Payoff	Direct	Indirect				What is the payoff of the innovation?
Target	People	Planet	Peace	Prosperity	Partnerships	What social issue is being addressed?
Role of Digital Technology	Enabler	Supporter				What is the role of digital technology in the innovation outcome?
Outcome	Device	Network	Service	Content		What type of digital resource is the outcome of the innovation?

Figure 2. Taxonomy of DSI

Agent Dimension

The "Agent" dimension answers the question in what setting the incumbent is innovating. The incumbent can conduct the innovation process in isolation, without any external partners (characteristic: "Isolated") or in cooperation, with external partners. In terms of innovation, building relationships with external partners holds many advantages (Sanzo et al., 2015; Phillips et al., 2019). In this way, incumbents broaden knowledge, access new markets, gain new skill sets, and recognize new opportunities (Phillips et al., 2019). Incumbents can therefore either innovate with external partners (characteristic: "With Partners") or through external partners (characteristic: "Through Partners") (Caroli et al., 2018; Phillips et al., 2019). Innovation with partners states that the incumbent works actively together with partners outside the company to co-create an innovation. Innovating through partners can be understood as the company being solemnly active for instance as a sponsor or investor, with innovating through the partner's skills, resources, and competencies (Sanzo et al., 2015; Caroli et al., 2018; Phillips et al., 2019).

Direction Dimension

The "Direction" dimension distinguishes between the innovation activity being initiated from "Top-Down" or from "Bottom-Up" (Gaynor, 2013; Boelman et al., 2014). A top-down innovation in general is usually implemented in the incumbent's strategic agenda, explicitly assigning resources and making it a fully funded project (Gaynor, 2013). In contrast, individuals drive bottom-up innovation. Those individuals usually have sense for innovative ideas aiming at changing the current status-quo. After evolving the innovation idea and securing funding, the innovation effort usually turns into a fully supported organizational project, which then can be characterized as being top-down (Gaynor, 2013).

Objective Dimension

As mentioned in Section 2, there are several definitions for innovation. We concentrate on the "Objective" of the innovation as either being explorative or exploitative. "Exploration" means that the innovation is radical – the incumbent is seeking new market opportunities, addresses new customers and accumulates new knowledge (Benner and Tushman, 2003; Vrontis et al., 2017). "Exploitation", on the other hand, means that the incumbent can build on existing knowledge. The innovation is incremental, focusing on existing markets and existing customers (Benner and Tushman, 2003; Vrontis et al., 2017). In order to be successful in the long-term, incumbents need to balance both activities.

Payoff Dimension

The "Payoff" dimension aims at answering the question whether the payoff of the innovation is "Direct" or "Indirect". Direct can also be seen as having first and foremost an economic value with the outcome being direct revenues (Dawson and Daniel, 2010; Baptista et al., 2019). Indirect, on the other hand, places the social value in the centre, with immediate revenues not necessarily being visible (Dawson and Daniel, 2010; Baptista et al., 2019). Good examples for indirect payoffs are SIs aiming for employee satisfaction. A motivated and satisfied employee works harder and more efficiently, therefore having a positive effect on the incumbent's growth (Antoncic and Antoncic, 2011). Moreover, another example is corporate volunteering. People feel more fulfilled when executing social work; therefore, employees

participating in an incumbent's social tasks are usually more satisfied (Vinerean et al., 2013), which in turn leads to higher financial returns for the incumbent (Antoncic and Antoncic, 2011).

Target Dimension

As defined in Section 2.2, SI cases can usually be mapped to one of the 17 SDGs defined by the UN (Eichler and Schwarz, 2019). All SDGs can be assigned to the categories people, planet, prosperity, peace, and partnerships, which represent the characteristics of the "Target" dimension (Wu et al., 2018). The category "People" aims to end poverty and hunger, ensuring education, well-being and gender equality. Every goal regarding saving the planet for current and future generations is assigned to the characteristic "Planet". The category "Peace" intends to end violence and create a safe environment without fear. "Prosperity" aims for proper economic growth ensuring that everyone can savour a fulfilling and prosperous life. The last category, "Partnerships", motivates to create partnerships in order to fulfil the SGDs (United Nations, 2015). The categorization along the 17 SDGs, more precisely their respective upper categories, has been confirmed through mapping real-world objects to the developed taxonomy. A lot of incumbents show in their business reports which of their actions help to fulfil which SDG (e.g. BASF SE, 2019; SAP SE, 2019).

Role of Digital Technology Dimension

The dimension "Role of Digital Technology" describes how DT is used in the DSI outcome. We classify the role of DT as either being an "Enabler" or a "Supporter" (Benbasat and Zmud, 2003; Nambisan et al., 2017). In our taxonomy, the DT enables an innovation when the DT is crucial for this innovation and takes a key part. Support, on the other hand, means that the DT enhances the innovation, however, the DT is not key part of the innovation.

Outcome Dimension

The last dimension of the taxonomy is "Outcome", addressing which type of DT is the result of the DSI. DTs can be categorized via "Device", "Network", "Service", or "Content" (Yoo et al., 2010; Henfridsson et al., 2018). These layers are loosely coupled and are part of a digital architecture (Yoo et al., 2010). A detailed definition of the different layers is provided in Section 2.1.

5 Demonstration

5.1 Sample for Demonstrating Application

We extracted a set of real-world objects from the 2018 business reports of the German DAX30 incumbents. As DAX30 incumbents are the biggest and best-selling incumbents in Germany (Deutscher Derivate Verband e.V., 2019), we assume that they have enough resources available to pursue DSI. Therefore, the use of their respective business reports presented us with a valid underlying population. Moreover, we explicitly used the business reports as they contain those DSI projects that are used to position their brand towards external stakeholders and are therefore most important to the incumbents (Sweeney and Coughlan, 2008; Lindgreen and Swaen, 2010). The focus in scanning the reports were especially catch words like "social" and "innovation". Furthermore, the non-financial section of each report was scanned in detail, leading to a final set of 29 real-world objects. If the business report did not contain enough information about the respective case, their websites with information about the extracted cases of the incumbents were additionally searched.

While mapping the real-world objects, it became apparent that the "Direction" dimension is difficult to assess solely based on the business reports and without conducting interviews with representatives of the listed incumbents. The origin of the innovation process is usually not described in such a report, making it difficult for us to map the real-world objects to bottom-up or top-down. We decided to map all objects as a top-down characteristic, as all fully funded projects listed in a business report turn into a top-down initiative eventually (Gaynor, 2013). This, however, does not mean that some of the derived cases did not start as bottom-up initiatives.

5.2 Application of the Taxonomy on Five Cases of DSI

To demonstrate the applicability of our taxonomy, we present five cases of DSI projects derived from the business reports of the DAX30 incumbents. We have chosen to present the following five cases as they differ the most in addressing the individual characteristics of our taxonomy. Therefore, the applicability of the taxonomy can be well represented.

Case 1: #Hapi

BASF initiated the project #Hapi (Figure 3) (Agent: Isolated) (BASF SE, 2020). #Hapi helps tomato farmers in Egypt to secure their harvest and therefore their revenues. BASF developed a platform which combines data from different sources (e.g. weather forecasts, simulations about plant diseases). The early disease warning system informs farmers through SMS, or Interactive Voice Response, early on about possible plant diseases. This enables the farmers to treat their plants with BASF products before the plants are infected, avoiding loss of harvest. Moreover, the texts provide additional practical advice (Outcome: Network, Service, Content). BASF stated that #Hapi addresses the SDGs, no poverty (1) (Target: People), decent work and economic growth (8) (Target: Prosperity), industry, innovation, and infrastructure (9) (Target: Planet), and partnerships for the goals (17) (Target: Partnerships) (BASF SE, 2020). They aim at exploring new markets, whilst building partnerships (Object: Exploration) (BASF SE, 2019). As it is a genuine BASF product, the payoff is direct (Payoff: Direct). In the innovation outcome the DT is used in an enabling way, making it a key part of the innovation. It would not be possible to reach the tomato farmers on the same scale without the help of #Hapi (Role of DT: Enabler).

DIMENSION	CHARACTERISTICS				
Agent	Isolated	With Partners	Through Partners		
Direction	Top-Down	Bottom-Up			
Objective	Exploration	Exploitation			
Payoff	Direct	Indirect			
Target	People	Planet	Peace	Prosperity	Partnerships
Role of DT	Enabler	Supporter			
Outcome	Device	Network	Service	Content	

Figure 3. #Hapi by BASF

Case 2: Nectar

The product Nectar by Merck (Figure 4), was co-created with Bioniq (Agent: With Partners, Payoff: Direct) (Merck KGaA, 2019). It provides a plaster in the size of a 50 Euro cent coin for diabetes patients. Instead of having to draw blood with a syringe on a daily basis, they can wear the plaster for up to seven days. Underlying sensors analyse the interstitial fluids right under the skin, sending the data via wireless connection to the smartphone (Outcome: Device, Network, Service, Content). Merck aims to explore the growing market of Biosensing through partnering with Bioniq (Objective: Exploration), whilst targeting SDGs good health and wellbeing (3) and partnerships for the goals (17) (Target: People, Partnerships) (Merck KGaA, 2019). The DT enables an easy transfer and analysation of data, making it a crucial part of the innovation (Role of DT: Enabler).

DIMENSION	CHARACTERISTICS				
Agent	Isolated	With Partners	Through Partners		
Direction	Top-Down	Bottom-Up			
Objective	Exploration	Exploitation			
Payoff	Direct	Indirect			
Target	People	Planet	Peace	Prosperity	Partnerships
Role of DT	Enabler	Supporter			
Outcome	Device	Network	Service	Content	

Figure 4. Nectar by Merck

Case 3: Encouraging Future Generations

The program "Encouraging Future Generations" by Allianz (Figure 5) was established in 2016 with "SOS Kinderdörfer" and "Volunteer Vision" and aims for social inclusion (Agent: With Partners)

(Allianz Gruppe, 2019). In 2018, Allianz employees conducted the first online mentoring of young people (Outcome: Service) (Allianz Gruppe, 2019). While generating indirect revenue through their employee engagement (Payoff: Indirect), Allianz targets SDG quality education (4) through partnering with other organizations (17) (Target: People, Partnerships). The role of DT in conducting the mentoring programme online supports the innovation and does not postulate as being the key part (Role of DT: Supporter). As the DSI goes beyond the main business focus of Allianz, the main objective is exploration (Objective: Exploration).

DIMENSION	CHARACTERISTICS				
Agent	Isolated	With Partners	Through Partners		
Direction	Top-Down	Bottom-Up			
Objective	Exploration	Exploitation			
Payoff	Direct	Indirect			
Target	People	Planet	Peace	Prosperity	Partnerships
Role of DT	Enabler	Supporter			
Outcome	Device	Network	Service	Content	

Figure 5. Encouraging Future Generations by Allianz

Case 4: Mobile Health

Allianz became a shareholder of BIMA (Figure 6) (Agent: Through Partners, Payoff: Direct), deepening their impact in emerging markets (Allianz, 2017). Through BIMA's product "Mobile Health", which is a mobile health service (Outcome: Service), they help patients get fast and qualified consultation (Objective: Exploration). This prevents the scenario in which patients refrain from seeking professional medical help due to the long distance to the closest doctor's office and the high costs of consultation (BIMA, 2019). Therefore, the Role of DT is a key part of the innovation outcome (Role of DT: Enabler). With this product, the SDG good health and well-being (2) is targeted (Target: People).

DIMENSION	CHARACTERISTICS				
Agent	Isolated	With Partners	Through Partners		
Direction	Top-Down	Bottom-Up			
Objective	Exploration	Exploitation			
Payoff	Direct	Indirect			
Target	People	Planet	Peace	Prosperity	Partnerships
Role of DT	Enabler	Supporter			
Outcome	Device	Network	Service	Content	

Figure 6. Mobile Health by Allianz

Case 5: SDG Network

SAP employees can use the "SDG Network" (Figure 7) to connect with each other, propose initiatives to address the 17 SDGs (Target: People, Planet, Peace, Prosperity, Partnerships), and to vote for their propositions (Outcome: Service) (SAP SE, 2019). The platform itself does not represent the key part of the innovation but supports the connection of employees (Role of DT: Supporter). As the SI targets employees (Objective: Exploitation), it results in indirect financial returns (Payoff: Indirect). Moreover, there is no information about partners being associated with this project (Agent: Isolated).

DIMENSION	CHARACTERISTICS				
Agent	Isolated	With Partners	Through Partners		
Direction	Top-Down	Bottom-Up			
Objective	Exploration	Exploitation			
Payoff	Direct	Indirect			
Target	People	Planet	Peace	Prosperity	Partnerships
Role of DT	Enabler	Supporter			
Outcome	Device	Network	Service	Content	

Figure 7. SDG Network by SAP

6 Conclusion

6.1 Theoretical Implications

Despite its importance, the research topic of DSI is relatively new (Halpin and Bria, 2015). Compared to the IS discipline (Watson et al., 2010; Walsham, 2012), social topics have been part of disciplines like entrepreneurial research for much longer (Austin et al., 2006; Choi and Majumdar, 2014). Moreover, the potentials of using DTs to drive SI has just been recognized in research areas outside of the IS discipline (Tracey and Stott, 2017). To close this theoretical gap, combining both disciplines and bringing more interdisciplinarity into the research field of IS (Walsham, 2012), we defined the topic of DSI through structuring it via our provided taxonomy (Nickerson et al., 2013). Therefore, we applied the taxonomy development method by Nickerson et al. (2013). To account for a proper theoretical foundation, we conducted two iterations with a conceptual-to-empirical approach building on systematic literature reviews. The literature was searched across a variety of disciplines, aiming for interdisciplinarity, and resulted in a taxonomy consisting of seven dimensions: Agent, Direction, Objective, Payoff, Target, Role of Digital Technology, and Outcome. To test the taxonomy's practical applicability (Oberländer et al., 2018) after Iteration 1 and 2, a sample of 29 real-world objects were mapped, followed by Iteration 3, which aimed for studying the same set of objects in detail and account for further similarities and differences (Nickerson et al., 2013). The objects were derived from the 2018 business reports of the DAX30 incumbents.

As research on DSI is still in its early stages, our rationale for this study was to create a first overall understanding of the scope and need of incumbents for guidance toward DSI. This implies two explicit theoretical implications:

(1) Integrating SI enhances IS research: As different research disciplines were connected, the taxonomy shows the interrelation between different concepts, i.e. innovation, SI, and DI (Glass and Vessey, 1995). Integrating the social perspective into DI efforts increases the potential innovation objectives for incumbents and leads to value both for the incumbent and for society. That emphasizes that the integration of social topics opens up a plethora of potential in the field of DI research alone. Thus, IS discipline benefits from SI and vice versa (Watson et al., 2010; Walsham, 2012; Morrar et al., 2017). Therefore, we promote the integration of social topics beyond SI, which in return leads to new opportunities in future research endeavours.

(2) The taxonomy sets a foundation for future research: The taxonomy is the first attempt of conceptualizing DSI and provides a thorough understanding on a relatively new topic. It contributes to the current knowledge base and extends the body of descriptive knowledge on DSI, increasing our understanding of establishing a foundation for higher-order theories and therefore adding to theory building for the emerging discipline of DSI (Doty and Glick, 1994). The taxonomy provides the IS discipline with a first building block to guide organizations toward successful DSI, and thus sets a foundation for further prescriptive research.

6.2 Managerial Implications

Owing to digitalization, the growing opportunities for incumbents in regard to solving social issues grow every day (Walsham, 2012). While searching for DSI cases, it became apparent that many incumbents already use the potential of DTs to drive SI projects (e.g. ADIDAS AG, 2019; Deutsche Telekom AG, 2019). However, to structure their future approaches on DSI (Nickerson et al., 2013), we provide incumbents with a tool with which they can address the topic of social issues more easily. Furthermore, we show them the potentials of DTs. This implies four explicit implications for incumbents:

(1) Incumbents can further pursue DSI: As mentioned above, the interest of individuals in social topics becomes more present every day (Porter and Kramer, 2006). This is driven by digitalization and all the opportunities which come with it (Gimpel and Röglinger, 2015; Nambisan et al., 2017). In order to have a competitive advantage, it is important to address these changing customer demands (Vinerean et al., 2013). Moreover, as different cases showed (cf. M-PESA, Nectar), it is possible to create a business idea aiming at doing good and having a self-sustaining business model underneath (Merck KGaA, 2019;

Onsongo, 2019). Apart from these direct profits, indirect profits can also be generated by integrating employees into the innovation process (Antoncic and Antoncic, 2011) or by developing SIs specifically targeted at the employees. This can result in higher motivation (Venn and Berg, 2013; Vinerean et al., 2013), which can lead to higher profits (Antoncic and Antoncic, 2011). Incumbents could therefore further pursue DSI and integrate it in their strategic agenda (Berzin and Pitt-Catsouphes, 2015).

(2) Incumbents can enable more bottom-up DSI: Many innovative SI ideas arise from individuals (Boelman et al., 2014). In Section 5.1, we stated that an explicit differentiation between top-down and bottom-up initiatives of the cases in our sample was not possible due to incomplete information. Nonetheless, we want to stress the importance of setting an innovative culture from the bottom-up, therefore further integrating individuals in the innovation process (Gaynor, 2013). By doing so and offering the chance for individuals to become intrapreneurially active, employees' motivation rises (Venn and Berg, 2013), leading to satisfied employees as well as direct and indirect financial returns (Antoncic and Antoncic, 2011).

(3) Incumbents can be aware of DSI's internal and external importance: A lot of the social initiatives from our sample aim at solving external problems and addressing social issues in developing and emerging countries (e.g. #Hapi by BASF, Mobile Health by BIMA (BIMA, 2019; BASF SE, 2020)). However, addressing internal issues is equally important. Incumbents start by doing so, by for instance pushing inclusion (e.g. Business Beyond Bias by SAP (SAP America Inc., 2017)) or women empowerment initiatives (e.g. Business Women's Network by SAP (Verhaag, 2016)). This could be pursued further as these initiatives also address different SDGs (e.g. gender equality (5), reduced inequalities (10)).

(4) Incumbents can further exploit the potentials of DTs: The advantages of DTs are manifold. As mentioned before, DTs provide access to information, services, and the sustainability of businesses, which leads to them actively producing a better society (Grigore et al., 2017). Moreover, DTs are becoming cheaper, so that also the poorer population can be reached through the usage of DTs (Walsham, 2012; Onsongo, 2019). This gives incumbents a chance to exploit the potentials of DTs to solve social issues.

6.3 Limitations and Further Research

Our research has some limitations. We conducted the literature search in the WoS database and restricted the search string to being part of the title. Although this approach offered high-quality, high-quantity and interdisciplinary publications (Web of Science Group, 2019), further research should aim at integrating more databases and enlarge the keyword search to the search string being part of the overall paper topic. This could foster the re-evaluation of our taxonomy. As DTs are a rapid changing field (Berger et al., 2018), the taxonomy should be adapted from time to time, especially the digital part. Moreover, in order to extract real-world objects, we searched the 2018 business reports of the DAX30 incumbents. This presented us with a set of 29 cases, which, appearing in the business reports, are strategically most relevant to the incumbents (Sweeney and Coughlan, 2008; Lindgreen and Swaen, 2010). To expand this sample in a second step, the sustainability reports of the respective incumbents could be searched, followed by a search of their websites in regard to more cases. Moreover, international incumbents could be integrated, which would expand the set of real-world objects even more, achieving a larger sample. In a further research project, the demonstration of the taxonomy could be enhanced by conducting a cluster-analysis after mapping the exemplary objects. This would provide comprehensive information about the combination in which the real-world objects normally occur. Moreover, we noted a lack of knowledge regarding systematic recommendation for incumbents to manage DSI. This finding is not surprising given the absence of actionable guidance on DSI so far. Accordingly, we also call for future research on DSI in general.

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