Recombination in digital innovation: Challenges, opportunities, and the importance of a theoretical framework

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A B S T R A C T

In this article I argue that the quest to establish digital innovation as a research domain is hindered by three challenges. As digital innovation research we are too often: a) reifying the agency of digital innovation actors; b) developing explanations of digital innovation detached from the specifics of digital technology, and c) developing overly specific explanations of digital innovation. I begin by providing a brief overview of the recombination perspective and considering why this perspective holds great appeal in the digital age. I then engage with Henfridsson et al.'s (2018) value spaces framework as a platform for framing value creation and value capture in relation to recombination in digital innovation. Next, I push Henfridsson et al.'s arguments one step further to discuss them in relation to what I consider to be the key challenges for digital innovation research. Illustrating with some of my own recent projects, I suggest that in order to fully address these challenges we need to (1) develop explanations of digital innovation acknowledging the complexity of sociomaterial interaction in digital innovation; (2) develop explanations of digital innovation building on the specifics of digital technology, and (3) develop explanations of digital innovation based on an oscillation between the specific and the general. The article concludes by pointing to future challenges and developments for digital innovation research.

1. Introduction

The concept of digital innovation has received much interest in recent years, both in research and practice. However, despite the burgeoning interest in digital innovation in both academic and public discourses, digital innovation is not yet a fully developed research field, rather it is an emerging body of theory and practice that draws from a number of different social science disciplines. Currently there are widely shared ambitions to progressively achieve theoretical and conceptual coherence in digital innovation research (Nambisan, Lyytinen, Majchrzak, & Song, 2017) so as to better inform research and practice (Nylén & Holmström, 2015). As such, there is a need for deeper theorization of digital innovation initiatives and broader processes of transformative change.

With the digitization of innovation, traditional assumptions of value creation are being challenged (e.g., Henfridsson, Mathiassen, & Svahn, 2014; Yoo, Boland Jr., Lyytinen, & Majchrzak, 2012), raising the need for new theory development and inviting alternative conceptualizations of value creation. An important contribution towards this end is the paper by Henfridsson, Nandhakumar, Scarbrough, and Panourgias (2018) where an ambitious agenda for understanding recombination in digital innovation is articulated. In their paper, the authors have turned a scholarly eye to the notion of recombination in digital innovation to unpack the conditions and mechanisms that make it work. Below I examine their value spaces framework followed by a discussion of some key challenges and opportunities for recombination in digital innovation, paving the path for new theory development. Based on this examination I

conclude with an assessment of further avenues to pursue in digital innovation research.

2. Recombination in digital innovation: challenges and opportunities

Digital innovation refers the use of digital technology during the process of innovating or the outcome of innovation (Nambisan et al., 2017). The opportunity to innovate by digitizing products and offering digital services has proven to be challenging to firms in traditional industries (e.g. Henfridsson et al., 2014; Svahn, Mathiassen, & Lindgren, 2017). In contrast to a traditional value chain structure, typically present in traditional industries, value in digital innovation is created through non-linear, distributed control and dynamic processes in networked environments (Boland Jr, Lyytinen, & Yoo, 2007; Westergren & Holmström, 2012). At the very core of digital innovation we find digitization, which refers to the encoding of analog information into digital format (Tilson, Lyytinen, & Sorensen, 2010; Yoo et al., 2012). Through digitization, physical products become embedded with digital technology into traditionally non-digital products such as cameras (Tripsas, 2009), magazines (Nylén, Holmström, & Lyytinen, 2014), phones (Ghazawneh & Henfridsson, 2013), and cars (Svahn et al., 2017). With the advancement in digital technology, these digitized products can provide a much wider range of functionality than non-digital products.

Henfridsson et al. (2018) approach digital innovation as the outcome of the activities by which a set of digital resources are recombined in both design and use through connections across value spaces. Specifically, they offer the value spaces framework as a tool for better understanding value creation and capture in digital innovation. As such, they argue eloquently how the distinction between design recombination and use recombination is key for addressing the call for new perspectives on the business value of digital innovation, and how the notion of digital resources increases the granularity by which the creation and capture of value can be studied in digital innovation. In order to address recombination in design and use in digital innovation concurrently, the following key concepts are articulated:

- *Value space:* an evolving network of digital resources interlinked through connections established and dissolved by actors seeking to generate and appropriate value.
- *Digital resources:* entities that serve as the building blocks in the creation and capture of value from information in digital innovation. A particular digital resource belongs to one of the four value spaces: devices, network, services, or contents. It may also be part of several different value paths.
- *Design recombination:* the activity of generating a value path by connecting digital resources as a value offering to users.
- *Use recombination:* the activity of generating an ideographic value path by connecting digital resources in use.
- *Paths channeling:* the activity of steering value connections, and ultimately value paths, through one particular, or a combination of, resource/s to provide the potential for capturing value.

In a sense, digital innovation research as expressed by Henfridsson et al. (2018) can be seen as an intellectual descendant of Schumpeter (1934), who conceptualized innovation as rooted in the creation of recombinations. This is arguably more evident today than ever before as today's digital technologies are editable (Kallinikos, Aaltonen, & Marton, 2013), re-programmable (Yoo et al., 2012), and open for reinterpretation after a long period of use (Nylén et al., 2014). In their framework, Henfridsson et al. (2018) point at the flexibility of digital technology and provide a solid foundation for the further development of digital innovation theory. However, significant research challenges remain in developing digital innovation theory, especially when it comes to conducting empirical digital innovation research. As such, it is time to develop theories that explicitly incorporate the variability, materiality, emergence, and richness of digital innovation (Nambisan et al., 2017: 224).

These challenges are what I find as the most important concerns in today's digital innovation research: a) *We are reifying the agency of digital innovation actors*. There is a tendency in digital innovation research of making overly simplistic assumptions about the ability of digital innovation actors to cause change in the world, rather than acknowledging the complexity of how their actions interact with, and can be shaped by, wider change processes, a common theme in empirical digital innovation research; b) *We are developing explanations of digital innovation detached from the specifics of digital technology*. Digital technologies have been depicted as being editable (Kallinikos et al., 2013) and re- programmable (Yoo et al., 2012), but while thoughtful calls have been made to be sensitive to the specifics of digital technology, empirical digital innovation is yet to be equally thoughtful; c) *We are developing overly specific explanations of digital innovation*. There is a tendency in empirical digital innovation research to focus on the empirical detail of single cases, and ignore, or even resist, attempts towards the systematic generalization of insights and explanations. The distinction between "practice-near" and "practice-distant" research is useful in this context where practice-near inquiry is related to the notion of "experience-near" – a concept elaborated in the socio-cultural field by the cultural anthropologist Clifford Geertz (1974). According to Geertz, an alternation - or oscillation - between near and distant perspectives is required for the researcher who attempts to "stand back" and take a dispassionate view of the object of study. This ambition to be both specific and general is much needed in digital innovation research, as most empirical research provides overly specific explanations of digital innovation with little emphasis on generalization.

Addressing these challenges also presents us with a set of opportunities for digital innovation research. To illustrate these opportunities, I will build on my own efforts in exploring the link between digital innovation configurations and value creation as demonstrated in cases of digital innovation and value creation conducted at the Swedish Center for Digital Innovation.

1. Develop explanations of digital innovation acknowledging the complexity of sociomaterial interaction in digital innovation

Acknowledging the complexity of how actions in digital innovation interact with, and can be shaped by, wider change processes is a key for future research. By so doing we can begin to resist the tendency in digital innovation research to make overly simplistic assumptions about the ability of digital innovation actors to cause change in the world, and to consider how their actions interact with, and can be shaped by, wider change processes. As an illustration, Jonsson, Mathiassen, and Holmström (2018) analyzed how the distributed network of workers used a diverse portfolio of digital technologies to make decisions on when and how to maintain the mining machinery. Specifically, we advanced a new theoretical perspective on how key characteristics of digital technologies are implicated in networked, knowledge-based work practices. As such, the main thrust of our analysis was our appreciation of the complexity of sociomaterial interaction for digital innovation actors in the context of a mining plant. However, since any theory highlights some aspects while silencing others, a challenge for both Henfridsson et al. (2018) and Jonsson et al. (2018) is that in focusing on digital technology resources and the pathways associated with them, there is a danger that while the framework highlights the material, it diminishes the social.

2. Develop explanations of digital innovation building on the specifics of digital technology

A second key is to develop explanation of digital innovation building on the specifics of digital technology. As an illustration, Nylén et al. (2014) explored how a media company pursued its efforts at designing a digital magazine. The focal concern for our study was the evolution of the digital publishing platform Mag+ developed for tablet-based content delivery on the iPad. Seeking to develop explanations of digital innovation building on the specifics of digital technology, we analyzed how Mag+ integrated new interaction design principles to achieve a rich user experience, which led to the introduction of a new business model governing the production, distribution, and billing of the content. A challenge in theorizing from empirical observation to theory is to include the specifics of digital technology in empirical observations. For this purpose, the concepts introduced in the value spaces framework are highly useful as it is explicitly addressing the role of digital resources in value creation and value capture.

3. Develop explanations of digital innovation based on an oscillation between the specific and the general

A third key is to develop explanations of digital innovation based on an oscillation between the specific and the general. When adopting theoretical frameworks, researchers tend to withdraw from practice, becoming spectators of practice (Bourdieu, 1998: 133) in a way that may conceal the logic underlying practice in which practitioners are involved (Sandberg & Tsoukas, 2011). As such, an oscillation between the specific and the general is warranted as solid explanations should be both specific and general. To date, most empirical digital innovation research provides overly specific explanations of digital innovation with little emphasis on generalization. As an illustration of an attempt to be both specific and general, Arvidsson, Holmström, and Lyytinen (2014) developed a view of IS strategy in which we conceptualized challenges in the IS strategy process to explain how and why a paper mill - despite successfully implementing a strategic production management system - failed to produce intended strategic change. Drawing on a strategy-as-practice perspective to address this problem we oscillated between the specific and the general to identify salient factors that contributed to strategy blindness at the paper mill, and discussed how these factors affected strategic implementation processes. The oscillation between specific and the general enabled us to stand back, reflect and theorize based on our case, and the strategy-as-practice lens helped us to distance ourselves from the details of our case. Here is where I see future avenues to pursue for the value spaces framework, by seeking to combine the focal concerns for details, that is a strength associated with the framework, with a concern for the general. Below I outline one possible pathway for doing this.

3. Moving beyond the value spaces framework

Significantly, the value spaces framework is both scholarly and practical, making it a valued resource for not only for researchers but also for executives and others working to solve complex digital innovation challenges in practice. In generating essential theory for understanding the context, process, and outcomes of digital innovation Henfridsson et al. (2018) have leveraged the boundary between theory and practice to the benefit of both.

Juxtaposing the value spaces framework with the digital innovation opportunities outlined above, we can see how the framework can help us *develop explanations of digital innovation acknowledging the complexity of sociomaterial interaction in digital innovation*. Specifically, the framework acknowledges the persistence of multiple logics in digital innovation and considers how diverse meanings and pathways are perpetuated through iterative cycles of design recombination and use recombination that ultimately shape the nature of digital innovation. The framework is also well positioned to help us *develop explanations of digital innovation building on the specifics of digital technology*. It lies at the heart of the framework to take digital resources (rather than actors) as a starting point in exploring the outcomes of digital innovation. This is a key strength of the framework. When it comes to helping us *develop explanations of digital innovation based on an oscillation between the specific and the general*, the framework is stronger at the specifics and should be complemented with additional concepts or theoretical constructs to enable an oscillation between the specific and the general.

To yield new insights and develop new avenues for scholarly exploration I recommend the framework be complemented with a theoretical lens, thus enabling such oscillation between the specific and the general. Among many options here, exaptation theory provides us with a lens that, in my mind, holds a very interesting potential to help us in making sense of recombination in digital innovation. The discovery of new functions or recombinations is not purely driven by chance, but by what Garud, Gehman, and Giuliani (2016) refer to as manufactured luck. Acknowledging the complexity involved in this process, exaptation theory refers to a

diversification logic where new applications are discovered for existing knowledge or technology (Dew, Sarasvathy, & Venkataraman, 2004). Innovation by exaptation has received considerable interest lately (e.g. Andriani & Cattani, 2016; Dew & Sarasvathy, 2016; Garud et al., 2016) and the key idea behind exaptation theory is that many technologies find applications that were not foreseen when first developed. For example, technologies like the laser, the computer and plastics have continued to find new applications in very diverse sectors. Exaptation deals with two intertwined processes: one process that deals with a functional shift because it leads to the emergence of a new function for an existing artifact; and one process resulting in a functioning market niche (Andriani & Cattani, 2016). As such, building on the idea that recombination is essentially about creating and capturing new value by weaving components together in new ways, the increased flexibility associated with digital technology allows for such recombination (Kallinikos et al., 2013; Yoo et al., 2012). To me, it seems as if exaptation theory is well aligned with the value spaces framework. In particular, exaptation theory seems well positioned to explain the dynamics associated with paths channeling e.g. steering value paths through a combination of resources to provide the potential for value capturing. Thus, I see opportunities in drawing from exaptation theory in building on the value spaces framework to theorize recombination in digital innovation.

4. Conclusions

Henfridsson et al. (2018) should be commended for their very ambitious approach to recombination in digital innovation by offering the value spaces framework as a tool for better understanding value creation and capture in digital innovation. I have tried, in this paper, to extend their analysis to address what I consider to be the key challenges for digital innovation research. I personally think that we have overemphasized the idea of induction in empirical digital innovation research, suggesting that we are largely theory free in our empirical research. More often than not, I think that what we are doing is abduction rather than induction. Induction for me implies that we are generalizing from empirical observation, and that there is not really any a priori theory there, which is illusory. I think that to develop a richer understanding of the world, we do need to acknowledge how we connect to prior theory. As such, building on theory – as a statement of concepts and their interrelationships that shows how and/or why a phenomenon occurs (Corley & Gioia, 2011, p. 12) – will be a key for digital innovation research in the coming years. Specifically, I argue that we need to (1) develop explanations of digital innovation acknowledging the complexity of sociomaterial interaction for digital innovation actors; (2) develop explanations of digital innovation building on the specifics of digital technology, and (3) develop explanations of digital innovation based on an oscillation between the specific and the general. By doing so we can begin to incorporate the variability, materiality, emergence, and richness of digital innovation.

References

Andriani, P., & Cattani, G. (2016). Exaptation as source of creativity, innovation, and diversity: Introduction to the special section. *Industrial and Corporate Change, 25*, 115–131.
Arvidsson, V., Holmström, J., & Lyytinen, K. (2014). Information systems use as strategy practice: A multi-dimensional view of strategic information system implementation and use. *The Journal of Strategic Information Systems, 23*(1), 45–61.
Boland, R. J., Jr., Lyytinen, K., & Yoo, Y. (2007). Wakes of innovation in project networks: The case of digital 3-D representations in architecture, engineering, and construction. *Organization Science, 18*(4), 631–647.
Bourdieu, P. (1998). *Practical reason.* Cambridge: Polity Press.
Corley, K. G., & Gioia, D. A. (2011). Building theory about theory building: What constitutes a theoretical contribution? *Academy of Management Review, 36*, 12–32.
Dew, N., & Sarasvathy, S. D. (2016). Exaptation and niche construction: Behavioral insights for an evolutionary theory. *Industrial and Corporate Change, 25*, 167–179.
Dew, N., Sarasvathy, S. D., & Venkataraman, S. (2004). The economic implications of exaptation. *Journal of Evolutionary Economics, 14*, 69–84.
Garud, R., Gehman, J., & Giuliani, A. P. (2016). Technological exaptation: A narrative approach. *Industrial and Corporate Change, 25*, 149–166.
Geertz, C. (1974). "From the native's point of view": On the nature of anthropological understanding. *Bulletin of the American Academy of Arts and Sciences*, 26–45.
Ghazawneh, A., & Henfridsson, O. (2013). Balancing platform control and external contribution in third-party development: The boundary resources model. *Information Systems Journal, 23*(2), 173–192.
Henfridsson, O., Mathiassen, L., & Svahn, F. (2014). Managing technological change in the digital age: The role of architectural frames. *Journal of Information Technology, 29*(1), 27–43.
Henfridsson, O., Nandhakumar, J., Scarbrough, H., & Panourgias, N. (2018). Recombination in the open-ended value landscape of digital innovation. *Information and Organization, 28*(2), 89–100.
Jonsson, K., Mathiassen, L., & Holmström, J. (2018). Representation and mediation in digitalized work: Evidence from maintenance of mining machinery. *Journal of Information Technology.* (in press) https://link.springer.com/content/pdf/10.1057%2Fs41265-017-0050-x.pdf.
Kallinikos, J., Aaltonen, A., & Marton, A. (2013). The Ambivalent Ontology of Digital Artifacts. *MIS Quar- terly, 37*(2), 357–370.
Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital innovation management: Reinventing innovation management research in a digital world. *MIS Quarterly, 41*(1), 223–238.
Nylén, D., & Holmström, J. (2015). Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons, 58*(1), 57–67.
Nylén, D., Holmström, J., & Lyytinen, K. (2014). Oscillating between four orders of design: The case of digital magazines. *Design Issues, 30*(3), 53–68.
Sandberg, J., & Tsoukas, H. (2011). Grasping the logic of practice: Theorizing through practical rationality. *Academy of Management Review, 36*(2), 338–360.
Schumpeter, J. (1934). *Capitalism, socialism, and democracy.* New York: Harper & Row.
Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing digital innovation in incumbent firms: How Volvo cars managed competing concerns. *MIS Quarterly, 41*(1), 239–253.
Tilson, D., Lyytinen, K., & Sorensen, C. (2010). Digital infrastructures: The missing IS research agenda. *Information Systems Research, 21*(4), 748–759.
Tripsas, M. (2009). Technology, identity, and inertia through the lens of "The Digital Photography Company". *Organization Science, 20*(2), 441–460.
Westergren, U. H., & Holmström, J. (2012). Exploring preconditions for open innovation: Value networks in industrial firms. *Information and Organization, 22*(4), 209–226.
Yoo, Y., Boland, R. J., Jr., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization Science, 23*(5), 1398–1408.

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