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Enabling Digital Transformation Strategies with Hackathons in Large-Scale Critical Infrastructures

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Abstract

In order to be successful and effective, digital transformation requires a significant effort related to reinvention in an organization. In addition, there are many cultural changes and collaborative requirements that must be applied. The use of hackathons has gained in popularity as a method of collaboration to quickly solve a business problem. Companies have used hackathons to build prototypes, elicit design ideas, make decisions, and explore innovative ways to do things. This study utilized a qualitative dataset that was collected during multiple hackathons conducted in a large global commercial/consumer water pump company. The preliminary findings from this research project indicate that elements of digital transformation occurred both during and after the hackathon. Future research leads to the proposal of an updated framework for strategizing-as-practice that can be utilized to qualify strategizing and prototyping experiences from hackathons over complex large-scale critical infrastructures.

Keywords: Hackathon, digital transformation, strategizing-as-practice, critical infrastructure

Introduction

Hackathons are recognized as a new way to innovate and co-create value (Baccarne et al., 2015) in corporate as well as in open innovation contexts. They are experienced by all stakeholders as intensive, time-bounded events (Nolte et al., 2018) and frequently used as a participatory problem-solving tool (Komssi et al., 2015) that enables companies and public sector institutions to create prototypes and demos for new digital solutions within a very short time period. The process brings together very motivated and well-skilled programmers along with domain experts to collaborate and prototype a digital solution in the given hackathon time frame. This is typically performed in 1-7 days as an event where students, programmers, business developers, and experts of different domains can come together in one place and form teams that commit themselves to performing a task. The innovative processes that are an output from hackathons are frequently explorative in nature, and result in finding new solutions/ideas, finding problems or solutions that are not expected, or result in the creation of new products in a collaborative manner (Granados & Pareja-Eastaway, 2019). Research communities have realized to the same extent the huge potential that the “hackathon phenomenon” (Briscoe & Mulligan, 2014) bears for accelerating the implementation of large-scale digital innovation products and processes (Choi (2016) along with a new way to build “ground up”

strategies. Nevertheless, there are not many comprehensive studies that explore corporate hackathons from a holistic methodological, as well as from a theoretical well-grounded perspective (Nolte et al., 2018). In addition, more exploration is necessary related to the perspective that hackathons can lead to different “strategizing practices” in larger corporate digital transformational settings. As discussed in Jarzabkowski et al., (2007), there is a need for multiple perspectives to bring in strategy in addition to micro-level outcomes (including human behavior). With this research paper, we aim to bridge these gaps. Therefore, our research question is: *What are organizational drivers and mechanisms inherent in corporate hackathons that enable digital transformation in critical infrastructure organizations?*

This paper is a work-in-progress and is organized as follows: First, we will explore hackathons and discuss insights related to how they can be used to enhance different digital innovation and digital transformation strategic perspectives. Next, we will discuss the evolving roles that hackathons played in a large organization to achieve digital transformation. Lastly, we propose a new framework for analyzing hackathons from an integrated three-dimensional perspective of strategy-as-practice. This new view extends the problem-solving framework of Galliers (2007) in the sense that it brings in more concrete insights from an empirical longitudinal study of a corporate hackathon in a large-scale critical infrastructure organization.

Digital Transformation and Strategizing Processes

Digital transformation requires a significant change in both processes and workforce within an organization (Eden et al., 2019). The effects of digital transformation can be a reinvention, not only of the organization, but also an entire industry (Gurbaxani & Dunkle, 2019). Our definition of digital transformation utilizes that of Vial (2019), which is “a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies” (pg. 118). We focus our research insights on large-scale corporations that are using hackathons to drive digital transformation across critical infrastructure organizations. Critical infrastructure is defined in Executive Order 13010 (Moteff et al., 2003) to include infrastructures such as telecommunications, gas and oil, electrical power, banking and finance, transportation, water supply systems, emergency services, and continuity of government. There are many sectors within critical infrastructure, with the water supply system sector including wastewater and clean water pumps. Large-scale critical infrastructure are extremely data-intensive and critical from the social, political, and environmental point of view. In addition, these systems are key to ensuring an effective, well-functioning society. For example, Henderson & Venkatraman (1993) discuss the importance of alignment between business and IT strategy in order to achieve business transformation. Their proposed Strategic Alignment Model also takes external perspectives into consideration. Tuebner (2013) discusses IS strategy as providing technical aspects needed in order to execute the business strategy. In addition, as technology advances, there is a need for new development approaches through the sharing of knowledge flows in cross-collaborative environments (Yoo et al., 2010). For these changes to be successful, a shift is required in the employee mindset, not just at the leadership and organization levels (Kane, 2019). While exploring traditional literature on IS strategies vs digital innovation strategies, we realized that most of these studies are top-down strategic studies, which seem not to include new digital innovation phenomena such as hackathons that are rather seen as bottom up approaches.

The Emergence of Hackathons as Business Prototyping Practice

Hackathons in Organizations

The hackathon phenomenon (Briscoe & Mulligan, 2014) has gained tremendously on business influence and economic value in open innovation (Bogers & Horst, 2014), entrepreneurial domains (Irani, 2015), in larger corporate environments, as well as in public spaces. For traditional hackathons organized in open domains, as well as for the new corporate hackathons envisioned here in our paper, the term “hack” is referring only to a way of “exploratory programming”, in the positive sense of “ethical hacking” for better solutions (Oriyano, 2016), not implying any of its negative meanings (e.g. malicious hacking, cyberattack). The traditional use of hackathons in open innovation contexts looks very different from the emerging and new corporate hackathons formats in large-scale business and especially in industrial environments. These types of corporate hackathons are usually conducted inside a large industrial manufacturing company

setting with employees coming together from different departments and independent business units of the same corporation. They are keen on solving a concrete problem that is relevant specifically within their larger cross-departmental and cross-business contexts. The harsh data security and intellectual property and privacy issues that usually require hard Non-Disclosure Agreement (NDA) conditions, are treated looser than, if the cross-departmental hackathon is taking place with unknown people and collaborated in an open hub domain. It also means that the employees and executive managers can act more freely within their known internal corporate context.

Hackathons as Drivers of Digital Innovation

Industrial hackathons are a form of industrial interactive workshop with rapid prototyping experiences as the major focus of the collaborative and creative setup. In a follow up journal paper, we aim to focus our conceptual research contribution to better understand how corporate and specifically industrial corporate hackathons are used as strategic tools to drive complex digital transformation processes across large-scale digital infrastructures. How can we find more plausible theoretical foundations for mapping strategizing practices in “real-time” from collaborative hackathon prototyping experiences.

From a theoretical and methodological research perspective, our research focus is to develop a deeper conceptual understanding for these emergent, transitional strategizing perspectives. So far only hackathons in open domains have been studied as a way of “positioning boundary organizations” (Seravalli & Simeone (2016). Additionally, we are using the insights from a longitudinal empirical research case study in a large Danish company that is manufacturing and providing high-end water pump systems and services as backbones of large-scale water –energy critical infrastructures. We have gathered and evaluated the “early stage experiences of employees and managers in the company while conducting corporate hacks. The industrial hackathons are conducted and their outcomes implemented in large-scale industrial internet-of-things (IIOT) transformational settings in a large industrial manufacturing company water pump producer (see next section case example). It seems that long-term and top-down traditional IS strategies are no longer used (Washington and Hacker 2004; Smith and Graetz 2011). On the other side, what are the organizational drivers and IS-(or technology-driven) mechanisms, in which a broader space and importance is given now to these new bottom-up and collaborative prototyping approaches, such as hackathons, sprints and agile methodologies.

Hackathons are increasingly more popular within corporate settings and/or hosted by large companies for driving complex digital business prototyping processes (Bogers and Horst, 2014) across larger corporate business processes. Large companies use hackathons more frequently as a strategic tool in the open hub spaces to drive crowdsourcing as well as marketing on new digital innovation ideas. With the comprehensive longitudinal empirical research case study conducted by Lauth (2019), these processes also enable digital transformation of work and business environments on a larger scale.

Industrial hackathons can have different formats depending on their corporate contexts mixture, e.g. as internal corporate hackathons, external or outside corporate settings, but maybe still holding to a corporate industrial challenge, and many more mixed forms. There are in total 400 different types of hackathons formats. In a hackathon, everyone in the corporate context can be included and participants have mostly equal roles during the prototyping and strategizing process. The hackathon room is a room where they can express their opinions and can contribute to future strategies with new ideas. Although they seem to be more inclusive in terms of stakeholders and contexts, hackathons are treated within corporate context as “parallel processes” or labeled as “unconventional” and short-term projects. The captured connotations from employees’ discussions and interviews show that hackathons are still not well defined and recognized as a standard industrial prototyping process within larger corporate domains, as well as within research literature on standardized business processes.

Research related to “strategy-as-practice” (Jarzabkowski et al., 2007; Jarzabkowski, P. & Spee, A. (2009); Jarzabkowski, P. and Kaplan S. (2014)) fail to place hackathons drivers and mechanisms within the three areas highlighted as the strategy-as-practice framework. These are: practices, practitioners, and praxis. Practices are the doing portion of knowledge; practitioners are the actors that draw from practices; praxis are the combined social, group, and individual activities (Jarzabkowski et al., 2007). Larger industrial studies, and most of the academic research studies in strategic IT, information systems management, organizational learning, and strategic innovation management are often looking at top-down and long-term

strategic and organizational approaches that cannot cope with fast and complex digital transformational challenges in larger global industrial environment.

Case Example Discussion and Preliminary Findings

The company in the case study is a pump manufacturer that produces over 16 million pumps annually with a product line of over 400,000 products. The company has industry-focused and consumer-focused lines including water, waste, heating and cooling, and irrigation pumps. The hackathons had all in common Industrial Internet of Things (IIOT) challenges given by the same industrial company. Two strategic hackathons have been fully recorded and evaluated from a corporate strategic point of view. The data has been gathered before, during and after the hackathons. In the two hackathons only company employees and long-term strategic development partners from corporate contexts, as well as higher executive managers of 6 departments have been included in the hackathon (in one of them as Jury).

Preliminary indicators in the data observe that hackathons were found as a new way to work and innovate. This supports that digital transformation strategies as outcomes to achieve organizational change. Support was also found for hackathons as a new collaborative process. The collaboration that occurred facilitated digital innovation in the development of new prototypes. Also, due to the hackathon, there was a faster implementation time and faster time-to-market. These ideas were not realized by the hackathon team until after the hackathon but allowed the team to achieve cross-context innovation. Therefore, practitioners across all domains as well as academics are interested in exploring new ways to deeply understand the nature of large-scale transformational processes along with the establishment of new strategizing as a practice mechanisms as highlighted in Figure 1 and extended from Galliers (2007).

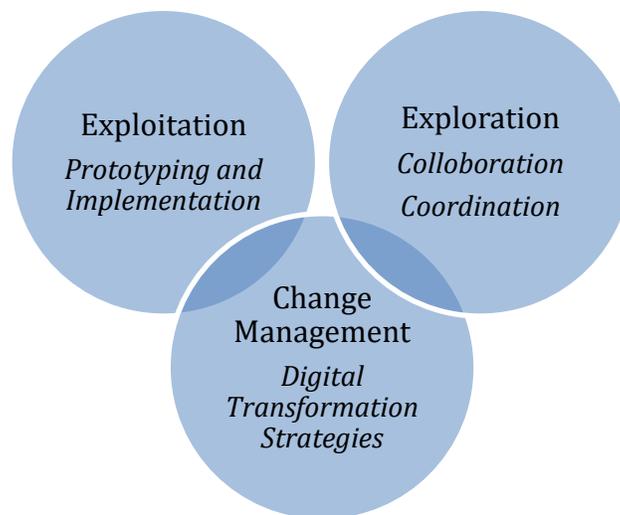


Figure 1: Proposed Extended Framework

With the proposed framework in Figure 1, we can combine the three dimensions relevant to strategy-as-practice, including exploitation, exploration and change management with outcomes and processes occurring in hackathons. For example, in the hackathons conducted in our case study we found a lot of short-term prototyping processes, where engineers and developer as teams are “exploiting” or extracting the knowledge and the prototypes deliberately in new areas and contexts. Large critical infrastructures require, for example, a careful cybersecurity solution able to maintain a large-scale digital infrastructure. This type of solution will ask also for a better “exploitation of data“ in such environments. With a bottom up approach companies will try to organize hackathons inside as well as outside their industrial context, in order to exploit new resources and skills specific to implement such solutions. The next unit “Exploration” is related to collaborative and co-creational aspects in hackathons. This is the point where teams of hackathon orchestrators are looking for new opportunities to change their service and products with new ones. The last section is dealing with change processes across larger organizational settings, and also here hackathons can be used to drive digital transformation strategies and processes in larger communities. Internal corporate hackathons are dealing with high-end mature digital Business 2 Business (B2B)

infrastructures and are targeting large-scale B2B digital business services across thousands of connected pumps, each one of those forming very complex and critical digital business ecosystems.

The major organizational drivers building new digital infrastructures are the collaborative processes across those large scale digital infrastructures. This can be attributed to the area of “exploitation strategy” (see Figure 1). The angle of looking at hackathons as a new way to drive “collaborative processes” that can be mapped over new steps into production and maturation of prototypes”, products or services, is a very outcome-oriented way of looking at hackathons, therefore “exploitative strategizing view”. The second dimension is looking at hackathons as tools for innovation and co-creation of new services, products and infrastructures. It is the traditional view of evaluations the “creative and participatory “dimensions of hackathons. The studies that are mostly missing are empirical studies on the long-term change manager organizational perspective, which is mapping the hackathons prototyping processes and outcomes to corporate strategies at larger organizational level. This short paper and the follow up journal paper, is meant to combine all these three perspectives into one overarching theoretical perspective for including top-down strategies, as well as bottom up collaborative prototyping outcomes into a holistic framework of “strategizing as practice”. The empirical experience shows that from moving from top-down strategizing practices into bottom up and vice versa, as lot more new and flexible insights of creating future and complex large-scale digital strategies can emerge and be included form different perspectives.

Conclusion

This research is an important contribution to the areas of digital transformation and strategy-as-practice, as well as to using hackathons as strategic enablers of strategy-as-practice. By exploring this particular industry, the authors were able to determine that hackathons can contribute to creating and expanding digital transformation strategies. Future research will build upon the extended framework and bring in additional insights related to the intersection of theory and hackathon data.

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References

- Baccarne, B., Van Compernelle, M. & Mechant, P. (2015) Exploring Hackathons: Civic vs. Product Innovation Hackathons,” in i3 conference 2015: Participating in Innovation, Innovating in Participation.
- Bogers, M. & Horst, W. (2014). Collaborative Prototyping: Cross-Fertilization of Knowledge in Prototype-Driven Problem Solving. *Journal Product Innovation Management*, 31(4), 744–764.
- Briscoe, G. and Mulligan, C. (2014). Digital Innovation: The Hackathon Phenomenon. Creative London Working Paper Number 6, 1 – 13.
- Choi, M. (2016). Organizing Open Digital Innovation : Evidence from Hackathons. Conference Proceedings International Conference on Information Systems (ICIS), Dublin, Ireland.
- Eden, R., Burton-Jones, A., Casey, V., & Draheim, M. (2019). Digital Transformation Requires Workforce Transformation. *MIS Quarterly Executive*, 18(1), 1 – 17.
- Galliers, R.D. (2007). Strategizing for Agility: Confronting Information Systems Inflexibility in Dynamic Environments. In *Agile Information Systems: Conceptualization, Construction, and Management*.
- Granados, C. & Pareja-Eastaway, M. (2019). How Do Collaborative Practices Contribute to Innovation in Large Organisations? The Case of Hackathons. *Innovation: Organization & Management*, 21(4), 487 - 505.

- Graham, P. (2014) Hackers & Painters: Big Ideas from the Computer Age. Monographs of the Society for Research in Child Development. doi: 10.1111/mono.12086.
- Gurbaxani, V. & Dunkle, D. (2019). Gearing Up for Successful Digital Transformation. *MIS Quarterly Executive*, 18(3), 209 – 220.
- Henderson, J.C. & Venkatraman, N. (1999). Strategic Alignment: Leveraging Information Technology for Transforming Organizations. *IBM Systems Journal*, 38(2&3), 472 - 484.
- Irani, L. (2015). Hackathons and the Making of Entrepreneurial Citizenship. *Science Technology Human Values*, 40(5) 799–824.
- Jarzabkowski, P. & Spee, A. (2009). Strategy-as-practice: A review and future directions for the field. *International Journal of Management Reviews*, 11(1), 69-95.
- Jarzabkowski, P. and Kaplan S. (2014). Strategy Tools-In-Use: A Framework for Understanding “Technologies of Rationality” in Practice. *Strategic Management Journal*, 36 (4), 537-558.
- Jarzabkowski, P., Balogun, J., & Seidl, D. (2007). Strategizing: The Challenges of a Practice Perspective. *Human Relations*, 60(1), 5 – 27.
- Kane, G. (2019). The Technology Fallacy. *Research-Technology Management*, Nov-Dec '19, 44 – 48.
- Komssi, M., Pichlis, D., Raatikainen, M., Kindstrom, K., & Jarvinen, J. (2015). What Are Hackathons For? *IEEE Software*, 32, 60 – 67.
- Lauth, C. (2019). IMP.ACT Industrial Hackathons – Findings from a longitudinal case study on short-term vs long-term transformational prototyping processes from corporate hackathons. Unpublished Manuscript, Copenhagen Business School.
- Moteff, J., Copeland, C., & Fischer, J. (2003). Critical Infrastructures: What Makes an Infrastructure Critical? *Report for Congress, The Library of Congress, Updated January 23, 2003*.
- Nolte, A., Bird, C., Than, E.P.P.P., Herbsleb, J., Scallen, S., & Filippova, A. (2018). You Hacked and Now What? Exploring Outcomes of a Corporate Hackathon. Proceedings of the Workshop on Hacking and Making at Time Bounded Events, Montreal, April 22, 2018.
- Oriyano, S.P. (2016). CEH v9 Certified Ethical Hacker Version 9: Study Guide. Indianapolis, IN: John Wiley Sons, Inc.
- Robinson, P.J. & Johnson, P. A. (2016). Civic Hackathons: New Terrain for Local Government–Citizen Interaction? *Urban Plan*, 1(2), 65–74.
- Seravalli, A. & Simeone, L. (2016) Performing Hackathons as a Way of Positioning Boundary Organizations. *Journal of Organizational Change Management*, 29(3), 326 – 343.
- Vial, G. (2019). Understanding Digital Transformation: A Review and a Research Agenda. *Journal of Strategic Information Systems*, 28, 118 – 144.
- Yoo, Y., Henfridsson, O., Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724 – 735.