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FACILITATING EMPLOYEE-DRIVEN DIGITAL INNOVATION THROUGH THE USE OF HACKATHONS – A CASE STUDY

Research paper

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Abstract

Open innovation has challenged and redefined the way organizations approach innovation and interact with stakeholders in the business environment. The democratization of work life has led to an increasing degree of inclusion of ordinary employees in the innovation processes, known as employee-driven innovation. Research on employee-driven innovation has up until now strongly focused on the characteristics and prerequisites for this form of innovation to arise. To a lesser extent, research has looked at how to facilitate the process of employee-driven innovation within organizations. Hackathons have emerged as a structured way to approach innovation in many organizations, especially software companies. In this study, we use a major international software company as a case study to look at the extent to which hackathons can facilitate employee-driven innovation, and especially digital innovation. We name this employee-driven digital innovation for two reasons: 1) because innovation processes are digitally mediated and 2) because the innovation products are also digital. Finally, based on theory from employee-driven innovation, we provide guidelines on how hackathons should be designed to increase the effects of hackathons as an enabler of employee-driven digital innovation.

Keywords: Hackathons, Employee-driven digital innovation, Case study.

1 Introduction

Ways to make innovation happen have attracted a lot of interest both from academics and practitioners during the last decades. Organizations have used billions to try to catalyze innovation (Anthony et al., 2019) and the ways to study this concept have been manifold, such as by focusing on creativity (DeGraff and Lawrence, 2002), management (Davila et al., 2012) and technology (Chesbrough, 2003). Different perspectives have been used to capture the development trends related to where and how innovation takes place. Among these, Yoo et al. (2012) have argued for the necessity of extending innovation theory based on the development trends to be able to provide both academics and practitioners with up-to-date explanatory models. Digital technologies have allowed organizations to better handle uncertainty in order to enhance novelty through digital intrapreneurship (Vassilakopoulou et al., 2020). Further, the applications of digital innovations have paved the way for digital transformation (Osmundsen et al., 2018; Opland et al., 2022; Pappas et al., 2018) in many businesses based on digital technology and capabilities (Khin and Ho, 2018; Svahn & Kristensson, 2022; Vassilakopoulou et al., 2022). The impact of digital innovation has in many contexts redefined when, where and how innovation takes place. Organizations have for decades relied heavily on closed approaches to innovation such as research and development units (R&Ds), but we now see evidence of a movement towards innovation processes increasingly opening up (Flores et al., 2020). Already in the late 1980s it was discovered that R&Ds brought an additional resource burden to the organization (Lengnick-Hall, 1992). These are some of the developmental features that influence where innovation takes place, when it happens and who makes it happen in the future.

Since their introduction during the 1990s hackathons have been perceived as a design process ideal for working with idea development and innovation (Olesen and Halskov, 2020). The strong focus on problem solving and prototyping (*idem*) has been emphasized as a main reason on why hackathons have emerged as a method for supporting innovation, especially in software development companies, as the roots of hackathons originate from time-restricted exploratory and investigate programming (“hack” and “marathon”) (Briscoe and Mulligan, 2014). With increasing interest, the application of hackathons has spread to cultural organizations, government agencies and research institutions due to hackathons being perceived as a relaxed organizational structure that encourages creativity and innovation and is relatively easy to host (*idem*). Notably, the designed level of flexibility and freedom in hackathons varies, including the way ideas are structured, format of the event, and to whether it is a competition (Kollwitz and Dinter, 2019).

Hackathons can undoubtedly play a role and contribute to idea generation and creative innovative activities in organizations, but as far as we know, the relations to the concept of employee-driven innovation have not been prominent in previous research (Opland et al., 2020; Opland et al., 2022). In this study our aim is therefore to see how characteristics of hackathons relate to employee-driven digital innovation, and how hackathons can be designed to facilitate and increase employee-driven digital innovation. We have therefore created the following research questions for the study:

R.Q.: How can hackathons be designed to facilitate and increase employee-driven digital innovation?

To address this research question, we study an organization that uses hackathons as an innovation activity and try to analyze this activity based on known theory associated with employee-driven innovation. Our findings from the study indicate that hackathons are well suited as a facilitator for employee-driven innovation, and we present a conceptual model for the use of practitioners in facilitating hackathons with a view to employee-driven innovation.

This paper is structured in the following way, section 2 presents the background and related work from previous studies within the research field, section 3 describes the research method used in this study, section 4 provides the findings and discussion before a conclusion is provided in section 5.

2 Background

2.1 Employee-driven innovation

Innovations can according to Whittington (2018) take shape both as an outcome and a process, and therefore be understood as a multidimensional concept (Haapasaari et al., 2018). Over the past decades, innovation has become derived into a myriad of sub-concepts, among these employee-driven innovation (Høyrup, 2012). Various definitions of employee-driven innovation have emerged, among these: “...generation and implementation of novel ideas, products and processes originated by a single employee or by joint efforts of two or more employees” (Smith et al. 2012). This perspective emphasizes that employee-driven innovation is not just about idea generation and the first phase in an innovation process, but actually driving this process through all the way to implementation of a new product, service or process. At the same time, it is emphasized in this perspective that this process is not a shielded activity that is only about the individual employee but can also be affected through collaboration with one or more employees or even external contributors. In his definitions of employee-driven innovation Høyrup (2010) uses the term “ordinary employees” to emphasize the fact that this is an innovation initiated and driven by employees who do not have research and development as part of their job description. This means that the concept of employee-driven innovation can be understood as a democratization (Høyrup, 2010) of the innovation processes in private or public enterprises and develops as bottom-up initiatives in organizations.

Amundsen et al. (2014) points out that the research on employee-driven innovation has developed into two different strands. The first one being occupied with the implications of employee-driven innovation, while the second one being occupied with the conditions. This paper’s focus on facilitation will therefore add to the theory related to the conditions. Crossan and Apaydin (2010) points to leader support, innovation culture and autonomy as determinants for innovation. According to the literature review conducted by Smith et al. (2012) four factors appear to strongly influence employee-driven innovation in organizations: leader support, autonomy, collaboration and organizational norms of exploration.

The first factor, leader support, has been singled out as the most important factor (Smith et al., 2012) for successfully implementing employee-driven innovation as an approach to innovation in organizations. This includes that employees have the support of their managers when it comes to getting involved in the innovation activities and processes, that they are encouraged to engage in such behavior and that the results that these innovation activities and processes lead to are appreciated and valued. At the individual level, there is both risk and vulnerability (Clegg et al., 2002) on the part of an employee by announcing their ideas, and it is crucial that this is supported by management.

The second factor, autonomy, is also considered to be important in enabling innovation (Smith et al., 2012) through giving the employees influence via delegated authority when it comes to decision-making and opportunities to control their own job tasks and the execution of these. Smith et al. (2012) also points out that autonomy is at the core of creating more flexible and efficient organizational processes. According to Parker et al. (1997) negative effects can be associated with creativity and innovativeness if employees are controlled by management.

The third factor, collaboration, is according to Smith et al. (2012) based on the assumption that employees are likely to be more creative when working together with colleagues and that this interaction between individuals sharing ideas is important for the phase of idea evaluation. Amundsen et al. (2014) points out that the way one establishes teams will affect the result of the innovation process, and it will be important to consider also during the innovation process. In the start of the innovation process the teams should be formed based on heterogeneity, while later in the process a more homogenous allocation of the teams could provide the best results (Amundsen et al., 2014).

The fourth and final factor pointed out by Smith et al. (2012) is the organizational norms of exploration. This is largely about organizational culture, and how the organization's norms and values support innovation. The organizational culture is a strong influencing factor when it comes to individual and collective behavior and can therefore be crucial to the extent that emerging ideas are implemented in the organization (Smith et al., 2012). Together with leader support the organizational culture will lay the premises for whether the employees perceive innovative behavior as desirable or not. De Jong and Kemp

(2003) argue that the innovation climate is most important when facing radical innovations and less important when facing incremental innovations.

2.2 Employee-driven digital innovation

Digital technologies are increasingly important to the transformation we see in organizations and society leading to an increasing desire for insights into and importance of digital innovation as “*Digital innovation is no longer just the business of software companies.*” (Ciriello et al., 2018). Digital innovation is a multi-faceted phenomenon suitable for cross-disciplinary research (idem). We use the following definition of the cross-disciplinary research field of employee-driven digital innovation; “*the initiation, development and implementation of new digital products, services or processes originating from “ordinary employees”, or the use of digital tools to support employee-driven innovation processes*” (Opland et al., 2022). Based on this definition, employee-driven digital innovation can happen along two directions but will often merge in the recognition that digital tools are enablers to implement employee-driven innovation through digital products and services.

Employee-driven digital innovation builds and is influenced by both the basic characteristics, values and beliefs from employee-driven innovation and digital innovation. That is, the characteristics that Smith et al. (2012) present regarding employee-driven innovation are assumed to be applicable here as well as those of digital innovation. Three key characteristics are often pointed to when it comes to digital technology and is also valid for understanding digital innovation. Yoo et al. (2010) draw on that when digitized information can easily be stored, transformed, transmitted, and traced. Kallinikos et al. (2013) point out that digital information is re-programmable and opens opportunities for changes and development also after being deployed. And Yoo et al. (2010) mention that it is self-referential, meaning that digital technology is the foundation for the creation of new digital technology. Based on the characteristics related to digital technology, which will influence the way ordinary employees can contribute to digital innovation, this constitutes what we call employee-driven digital innovation.

2.3 Hackathons

Along with the introduction of digital technology different process concepts have emerged as software companies have been at the forefront of the development, among these hackathons. Olesen and Halskov (2020) describe hackathons as a process to promote innovative behavior in organizations. By using hackathons as a process tool, organizations can focus individuals towards specific project goals and give them dedicated work hours aimed at being creative (Rosell et al., 2014). Hackathons can be seen as innovation events that are held over a limited period of time, from hours to days, in organizations and can be put together to consist of both internal and external actors (Ulfsnes et al., 2021). This has led to an increasing interest in hackathons as a process tool, not only in software companies, but also in government and educational institutions (Olesen and Halskov, 2020). Bringing ideas to the market, as hackathons consist of, can be interpreted as an inside-out open innovation approach however there is a lack of integrated models supporting outbound open innovation processes (Aloini et al., 2017).

According to Tkalich et al. (2021) hackathons can accelerate innovation at an organisation which is key in staying competitive, however they must be adapted to its own environment. Hackathons have therefore moved from being perceived solely as a design process related to coding of software towards becoming a process tool aimed at problem solving and innovation. Using hackathons, the problem solving has been addressed through working with ideation, prototype development and presentation in iterative cycles until a satisfactory solution to the problem has been put in place (Olesen and Halskov, 2020). The benefits of hackathons have led many organizations to make hackathons repetitive innovation activities that are carried out at specific points in time or at regular intervals. According to Ulfsnes et al. (2021) hackathons can even benefit the employees through providing opportunities for individual development and new learning.

The movement from being a specific process tool for software development companies, to gaining a place as a universal process tool for a number of different contexts, has affected both design processes related to the content and development of hackathons. We now see hackathons used as both centralized innovation activities in organizations, and locally distributed innovation activities at unit or team level. According to Rosell et al. (2014) internal hackathons can act as a facilitator for innovation in large

organizations, if they are organized in a proper way and with significant preparation. Rosell et al. (2014) points towards a number of factors being important in the preparation of the hackathon events for it to achieve being a cost-effective way of organizing innovation activities in organizations, among them: leadership support, publicizing the event, timing, team building, preparation of participants, incentives, hackathon infrastructure and details. The goals and objectives of the event seem to be important for the senior management to support the hackathons (Rosell et al., 2014). Similarly, it seems that publicity, timing, facilitating team building and preparing the participants in the event are crucial for employees to engage in the innovation activity (Rosell et al., 2014). There seems to be a great deal of consensus when it comes to factors for the success of employee-driven innovation pointed out by Smith et al. (2012) and factors for success in hackathons pointed out by Rosell et al. (2014). Ulfesnes et al. (2021) points out that hackathons can create benefits at both individual and company level and can be important in driving innovation and new product development.

3 Research method

3.1 Case study

To address the research questions in this paper we conducted a single case study (Yin, 2013) of a large global software developing company to study their use of hackathons. The case selection strategy followed purposeful convenience sampling – the researchers sought access to a company that had a strong culture of employee-driven innovation using hackathons, and which had prior collaboration with the company and was therefore familiar to the researchers with respect to company context, hackathon activities and access to various data sources.

The selected case company has long traditions for using hackathons as an innovation activity, both as a centrally organized company-wide event once or twice a year as well as locally organized departmental or team-level events at random points in time. The actor has over time developed experience in running these events and pays a lot of attention to how these hack events are organized. This includes advertising videos of the event, interviews with previous winners, overview of the history, portals for team formation and different types of hack event souvenirs. Ponelis (2015) argue that case studies are an appropriate research method for studying processes and problems to gain insights and develop an understanding of how to improve practices. This is supported by Orlikowski and Iacano (2001) within IS literature. We were able to study the company in a period where they went from organizing their hackathons physically to virtually because of the pandemic. The company is a global organization with offices both in Europe, Asia and North America. The company is rapidly growing and by the end of 2021 employed just under 7 000 people, both in technical and non-technical roles. Both unit specific and company-wide hackathons have led to the development of product and service innovations, which have benefited their customers and the business.

According to Yin (2013) the case study is appropriate as a method when the researchers try to explore a phenomenon in depth, over which the researcher has little or no control. In this study, we want to look deeper into whether and how hackathons facilitate employee-driven digital innovation, and the case study is therefore suitable to explore our research questions which are looking at relationships and processes and aim to understand the details of what is happening. The case study is known to be a time bounded research strategy, in which the researcher during a sustained period of time collects data (Yin, 2013). While case studies tend to generate rich evidence about a phenomenon, this strategy is known as less appropriate when aiming for generalization (Thomas, 2021).

3.2 Data collection

The data in this study was collected during the autumn/winter of 2021, using semi-structured interviews with 21 participants. Interviewees represented different parts of the organization, occupied different roles (technical and non-technical) and were situated in different locations globally (in North America, Europe and Asia). Participants were recruited through the search of volunteers with the help of hackathon organizers, internal communication channels used by hackathon enthusiasts, and through interviewees who were already interviewed. The recruitment of new interviewees continued until representatives of all the different groups of participants were interviewed (experienced hackathon

participants, recent hires who only participated once, technical and non-technical participants) and when the saturation point was reached, i.e., we did not get any new insight during the interviews that could illuminate the topic (Creswell and Creswell, 2018). We developed the interview protocol based on previous experience and reading related work on the research area and this was used as a guide for the semi-structured interviews. The interview guide included a mixture of close-ended and open-ended questions to combine a structure and also give the flexibility to go into depth and gain new insights when answers from the respondents yielded. All interviews were done by at least two researchers being present. During the interviews the lead author asked the questions, while the other researcher took notes. The researcher taking notes presented reflections at the end of the interview and asked follow-up questions. After each interview the researchers conducted an evaluation of the interview, discussing the information gathered and learning points from the interview to be used in the next interview, and to note the key findings when the interview material is still fresh in the memory.

The interviews varied in length from 25 minutes to 69 minutes. Because of the pandemic situation and the distributed geographical location of the respondents the interviews were done through the use of digital platforms and audio recorded. After the completion of all the interviews, the lead author transcribed the interviews. Starting from the fact that this study has an idiographic aim (Robinson, 2014) of understanding the phenomenon, the selection of 21 interview subjects is considered to be appropriate.

Inter- viewee	Role	Years at company	Inter- viewee	Role	Years at company
1	Designer	3	12	Full stack engineer	2
2	Engineering manager	7	13	Software developer	8
3	Backend engineer	5	14	Customer representative	1
4	Senior engineer	8	15	Senior product manager	4
5	Full stack engineer	3	16	Product manager	1
6	Backend engineer	1	17	Backend engineer	5
7	Mobile engineer	1	18	Consultant	3
8	Quality engineer	4	19	Backend engineer	3
9	Backend engineer	2	20	Backend engineer	1
10	Data scientist	2	21	Data scientist	1
11	Technical writer	4			

Table 1: Interviewees

3.3 Data analysis

Based on the transcriptions and the notes from the interviews an analysis was conducted by the researchers by first of all reading through all of the gathered material. The next step was to structure the thematic analysis (Creswell and Creswell, 2018), which is a common way to approach the analysis of qualitative data. To do this we used a coding scheme developed from the four factors associated with employee-driven innovation identified by Smith et al. (2012). This provided us with interrelating themes (Creswell and Creswell, 2018) that we could use to write up the interpretation of the gathered data in the discussion. These interrelated themes in the end provided us insights to propose the model in Fig. 1.

To address the validity of the findings in the study the researchers used different approaches proposed by Creswell and Creswell (2018) to enhance the accuracy of the findings. Among these we used a peer debriefing (Creswell and Creswell, 2018) as already explained, where the researchers discussed the interviews after running them. We also used member checking (Creswell and Creswell, 2018) where we wrote up a report and presented it to the hackathon organizers. The report was also made available to the interviewees for validation and feedback. As researchers we are also aware of the bias (Creswell and Creswell, 2018) we have brought with us into the researching situation. The researchers' background is from information systems and software engineering and that might have affected the findings in the study. It must be also mentioned that one of the researchers has a long collaboration experience within the case organization, which provided rich insight into the corporate processes, but might have also

biased the course of investigation. We believe that the use of peer debriefing and the choice of the key interviewer who is not familiar with the organization, has to a certain extent mitigated these threats.

According to Gioia et al. (2013) it is important for organizational studies aiming towards theory building to be able to validate their constructs. For this purpose, it is important to both consider construct validity, internal and external validity as well as reliability (Yin, 2013). As Yin (2013) points out, it is important to replicate theories in similar organizations before drawing conclusions about generalizing concepts.

4 Findings and discussion

The structure in the discussion is shaped along the characteristics of employee-driven innovation presented by Smith et al. (2012) in the section 2. The case organization in this study has a stated goal to use hackathons as a key innovation activity, and both centrally administered hack weeks and locally administered hack days are encouraged and carried out in the organization. The discussion, based on the characteristics of Smith et al. (2012), in sections 4.1-4.4, will lead to proposals for guidelines related to the design of hackathons in 4.5 to support employee-driven innovation.

4.1 Leader support

In their study, Smith et al. (2012) emphasized leader support as essential when it comes to characterizing employee-driven innovation. Their assumption is that the innovation practices and behavior must be supported by the management in the organization and that employees are encouraged to participate in innovation practices. This assumption is also supported by Crossan and Apaydin (2010) who points to leader support as a determinant for innovation. Earlier research has shown that without leader support, employee-driven innovation still might arise, but then in the hidden (Bäckström and Lindberg, 2018) with the negative side effects that this may entail.

In the case we have looked at, the very fact that one conducts corporate hack weeks and hackathons in the organization is a clear message from the management that these are innovation activities that are designed to encourage employees to participate in innovation. The management recognition of the value of hackathons is also evidenced in the fact that along with the centrally organized hack weeks or hackathons (company-level, supported by the top-management, usually longer in duration), there are also locally initiated hack days or hackathons (department-level, supported by middle management, usually shorter in duration). This is not surprising given the strong position that hackathons apparently have in the organization. Running of and participation in hackathons is a stated goal by the top management and has previously led to a number of product-/service innovations in the organization. Furthermore, the winning hack projects usually receive an opportunity to discuss the potential for productization. In this way, hackathons have acquired a central position as a process tool for innovation in the organization, and not only as a kind of innovation theater to fake the employee-driven component in the company's innovation strategy. The corporate recognition of hackathons is described by one of the respondents in the following statement:

"...we as a company want to emphasize innovation and having people be able to, you know, try new things..."

Although the top management actions evidence the general support of hackathons as an innovation activity in the organization, we also found indications that this support does not spread to all levels of management and all employees across the organization. One example of this was the lack of support in regard to following up promising ideas for further development and implementation after the hack events. One respondent was frustrated by the inability to book a follow-up discussion about the potential productization of the group's idea, which was awarded in a previous hackathon event, and told us:

"...I've been trying to get answers from leadership, from different leaders about it and even that has been challenging..."

We also gathered mixed evidence about the recognition of importance of hackathons among middle managers. On one hand, a clear example of recognition and support is that employees are allowed to clear their calendars and pause ongoing work tasks in order to focus on the hackathon events. Only urgent tasks connected to running the services are prioritized during these periods. On the other hand,

a few interviewees pointed out that some managers request prioritizing ongoing tasks over hackathon activities, participating in meetings or even postponing the hacking until better times.

Yet another example is related to the limited engagement of the managers of different levels in the hackathon events. Several respondents pointed out the absence of leaders as participators, who were said to prefer using the time allocated to these innovation activities for other purposes, e.g., keeping up with one's own backlog of tasks. This was seen by the interviewees as an indication of limited recognition of importance of hackathons as a truly company-wide activity.

Based on the findings from the study, and on leader support as a characteristic of employee-driven innovation highlighted by Smith et al. (2012) in theory, we claim that leader engagement and support in the implementation of hackathons as a process tool for innovation is important to facilitate employee-driven innovation.

4.2 Autonomy

Autonomy was also highlighted by Smith et al. (2012) as an important characteristic for employee-driven innovation to flourish. This relates to the core of the concept of employee-driven innovation where the aim is to facilitate bottom-up innovation initiatives and is also highlighted by Crossan and Apaydin (2010) as a determinant for innovation. Employee-driven innovation is in its purest form precisely about emerging ideas from ordinary employees (Høyrup, 2010). Furthermore, Høyrup (2010) also questioned whether innovation initiatives can still be called employee-driven if they are structured or directed by the management. Similarly, Parker et al. (1997) claim that management control inhibits creativity and innovativeness.

Hackathons must be perceived as a way of structuring the innovation approach, as they provide the organization with a framework for carrying out the innovation activity. In the studied case the innovation events have not just been structured through organizing hackathons, they have been even more structured in the way that they are arranged around selected themes to provide direction for the innovation activities. This arguably is against the claim that hackathons are employee driven. In addition to trying to provide structure with the themes, the organization has also structured team formation and the practical arrangement of the hackathon event program, including, pre-hackathon idea pitching, hack project registration, demonstration of the hack outcome at the end of the event, as well as the voting and awards. However, we found that this does not present an obstacle for those who want to carry out the activity in any way conflicting with these limitations. Several respondents told us that they participated in the hackathon events, but did not register upfront, did not form their teams through the provided portal, selected projects outside of the theme, and did not demo their hack at the end of the event. One respondent stated the following when asked if he was hacking along the themes selected by the management for the hack weeks:

“Sometimes...most, usually not...just scratching a personal itch. Well, it depends if I'm doing a creative hack. It's usually not aligned with any particular bit of business...”

Notably, the structure around the themes was not always there. Another respondent describes his frustration with the switch to structured themes and how it changed his perception of appropriate ideas for the hack projects:

“Everyone [hacked] these crazy ideas and the things that people wanted to experiment on. It was kind of fun. But at some point... we made a switch that for me removed the whole appeal of the hack days or weeks. It was like - “Now in hack days they need to hack a theme related to the [corporate] context”. So then it became ...at least for me, more tricky to find ideas and things to do.”

Interpreted, our findings confirm that strictly structuring innovation activities in the above-mentioned fashion can prevent hackathons from being perceived as employee-driven innovation events. At the same time, as also argued by Høyrup (2010), even more structured top-down initiated innovation activities can be perceived as employee-driven innovation, as also evidenced in our case. Several respondents point out that these structures did not affect their approach to using these innovation activities in a way that appears employee driven. What we discovered through our interviews was that

the thematization of the hackathons did not form all the ideas emerging during the hackathons. One interviewee described this in the following way:

“...I don't even always follow the theme, like we usually have themes for hack weeks. And if I have an idea [within] the theme, then great. But if I'm passionate about something else, then I just do that and I like I know I'm not even really qualified to compete in the end if I do that. But that's fine. It's just a week of time where I have the freedom to choose what I do with my time...”

In essence, the compliance with the top-down imposed themes seems to be a subjective matter, which shows that hackathon participants are given the right to act autonomously. In Smith et al. (2012) words authority for decision-making and opportunities to control their own tasks are delegated to the participants. However, we also find that the structuring of the themes does not encourage autonomy when it comes to project selection, as projects outside the top-down selected hackathon theme cannot be nominated for awards. In our case, the majority of participants value autonomy more than the awards, and do not see this as a problem, as described by this respondent:

“...I'm kind of the other way around. So if my idea gets shared because it's the winning or something like that, I'm afraid that others that come second or third [...] feel it's unfair. It creates a little bit of a social dilemma, in my words. So I don't really like [the competition], to be honest...”

Several respondents told us that they did not even register their ideas or projects in the official Hack project registration portal, which is another piece of evidence suggesting that employees are experiencing a high degree of autonomy during these innovation activities. Apart from the few participants who feel constrained, the thematization of the hack events seems to be experienced as creating a possible direction for the hacking and providing help to those who do not already have an idea. Some of the respondents even told us that they accumulated ideas and possible projects for the next event well in advance, and some of the respondents told us that they worked in back to back hackathons with the same idea and project, exemplified in the following statement:

“...there have also been hack projects that I return to for multiple hack sessions...”

Another example of the employee's autonomy can be found in the possibilities to use the hackathons not only to work on ideas, but also use the time for learning. Some of the respondents told us that they had used hackathons to learn a new programming language or to extend their knowledge and immerse themselves theoretically within a special area. One respondent described this in the following way:

“...I wasn't planning to join the week, I was planning to do some courses to learn some new things, but not to join the team because the hack week was like one month after I started, so I didn't feel confident enough to join a team...”

This way to use the hack events seemed to be most widespread between newcomers in the organization, that had not already built a network they could work on ideas within or did not already have a predefined idea going into the hackathon.

Based on the findings from the study, and on autonomy as a characteristic of employee-driven innovation highlighted by Smith et al. (2012) in theory, we claim that autonomy in the implementation of hackathons as a process tool for innovation is important to facilitate employee-driven innovation and while some structure elements like tools facilitating the participant activities are not restricting autonomy, others like top-down imposed themes can impede autonomy and motivation at least among some participants.

4.3 Collaboration

Collaboration was the third characteristic underlined by Smith et al. (2012) as important for employee-driven innovation. The premise here is that the innovation process both demands and benefits from taking place in environments that are characterized by collaboration as creativity appears to increase when discussing ideas with colleagues (Smith et al., 2012). Idea generation can be tied to individual creativity, but evaluation and further development of ideas are phases that benefit from groups of people that can discuss, share and bounce ideas. In these phases of the innovation process input and validation from others are crucial to increase innovativeness. This cannot least be useful in teams of employees

who have different roles, educational backgrounds, etc. in the organization, and therefore might have different approaches to perceiving an idea.

Interviewees from the studied organization confirmed that collaboration is important for innovation and described various ways how they contribute to idea generation and development. While we found that there have been many solo projects during the hack weeks, we also found that the organizers of the hack events explicitly encourage collaborative work on hack projects and support company-wide team formation. An example of this is the hack project portal, where everyone is welcome to register ideas and seek peers. In fact, participants can also register ideas marked “for adoption”, which is another example of cooperation. Furthermore, from ideation throughout the execution of the hack projects, participants had numerous opportunities to collaborate. Several respondents told us that one of the joys of this form of innovation activity was the opportunity to contribute not only to one’s own team, but also to other hack project teams. This was especially true for hackathon activities that were physically co-located. Here employees had the opportunity to walk around in the office and see what others were working on, give tips based on their own knowledge or help put groups and people in contact with others with special knowledge in the specific area or with similar ideas/projects. This was also a sign of collaboration in the phases of the innovation process following the actual idea generation.

We found that team composition in hackathons is interdisciplinary with people with diverse skills working together, often from different parts of the organization. In our case, several respondents highlighted the benefits of working in teams and how these worked in a good way. One respondent described the following:

“...You can team up with anyone in any part of the company anywhere globally. So it's a way also to find new partnerships and create new friendships in ways that we probably don't have the opportunity to do in our normal work...”

We also spoke to respondents occupying non-technical roles who claimed that they can represent customers or users, thereby creating further improvements in the products and services created. This emphasizes that employees see the value in collaborating around the idea evaluation and development and the benefit that input from others can have for their own idea. This finding is consonant with Amundsen et al. (2014) who underline that heterogeneity in the composition of teams or groups in early innovation phases is important.

Nevertheless, several respondents pointed to challenges surrounding team formation. We discovered that many ideas emerged from technical people, and these often failed attracting non-technical people to their teams, creating rather homogeneous teams. On the other side we discovered that employees in non-technical roles often failed to find the way to engage in technical hack ideas. This led to non-technical people experiencing feeling like second-class citizens because the perceived added value of one's own contributions to the group was low. The fact that these teams were largely self-organized only strengthened this experience for the non-technical people. Since R&D is the central part of the case organization that develops software products and innovation activities are oriented towards software product enhancement and new product development, naturally participants with the technical skills felt more valued and important during the hack weeks than non-technical participants. Here, a clearer structure for engaging non-technical roles when forming and organizing the teams could have helped to create a greater understanding of the expectations and the value of all participants. This is pinpointed by one non-technical respondent in the following statement:

“...I want to understand how to bring my expertise to, you know, the company...I'm here, but I'm not doing anything. How can I do it? ...”

Another challenge related to collaboration was found in relation to newly onboarded employees. Several of the new employees described team formation in the hackathons as particularly challenging, as they had established few contacts inside the organization. Much of team formation seemed to happen in informal settings, e.g., during lunches, at the coffee machines or through acquaintances. We also found that although the portal for hack project registration helped to find projects that called for participants, it was often technical skills that were sought after. Recent hires, who were new not only to the company, but also to the profession, did not feel suitable for participation and were often shy to engage. Thus, some of the recently employed respondents told us that they used hackathons to focus on learning and

extending their knowledge, as already mentioned in 4.2. Such participation, from our perspective, lies outside of the main purpose of hackathons and cannot be interpreted as employee-driven innovation, even though many people associate employee-driven innovation with learning (Høytrup, 2010).

Based on the findings from the study, and on collaboration as a characteristic of employee-driven innovation highlighted by Smith et al. (2012) in theory, we found that collaboration is important to facilitate employee-driven innovation in the implementation of hackathons as a process tool for innovation, and that there are various ways to enable collaboration within one and across multiple hack projects during one instance of the event.

4.4 Organizational norms of exploration

The last characteristic of employee-driven innovation emphasized by Smith et al. (2012) is the organizational norms of exploration. This can be interpreted as the organizational culture that relates to the collectively shared norms and values in the organization that supports innovation especially (innovation culture). Crossan and Apaydin (2010) associate this with innovation culture, and one can imagine that this is about, among other things, values like creativity and innovativeness highlighted as important for innovation by Parker et al. (1997). This characteristic must also be perceived as related to and affected by the previous characteristics discussed in section 4.1-4.3. But while the first three characteristics are behavioral (management support, autonomy and collaboration), this one is attitudinal and is about how all institutionalized actions in the organization are perceived, valued and emphasized, and how they become self-reinforcing.

The innovation culture can be discussed in light of what the goal of using hackathons as an innovation activity in the organization is. In the studied case we discovered that innovation in itself was deeply rooted in the organization's values and beliefs as perceived by the senior members of the organization, as well as by the recent hires who were interviewed. The organization positioned hackathons as events that target the innovative outcomes that can influence the development of products and services, but also the image of the organization, to appear innovative. The value of hackathons as events that enable innovation, autonomy and collaboration was mentioned by many interviewees, who expressed their enthusiastic attitude. One respondent told us:

“You know, for me, because I really enjoy hack weeks as a creative outlet, I kind of hold on to that is almost like better than my vacation”

This evidence shows what we can call innovation culture. The innovation culture is in many ways the temperature gauge of how well this matches the value and norm systems in the organization on which this is based, and which in turn leads to actions and behavior in the organization. This is also about innovation not becoming just an activity that one does as a result of one's job description, but which to a greater extent affects the activities in the organization and that innovation is foremost at the mind of everyone. A respondent told us, and which in a very good way describes how essential the organizational culture is in relation to involvement in the innovation activities:

“...then there was one hack we did as a group. So this was during the pandemic, but we physically booked an Airbnb together and we actually lived together for a week.”

This describes engagement in an innovation activity that must be characterized as being beyond what an employer can expect from its employees in terms of dedication when it comes to involvement. The statement also describes how engaging the employees experience the innovation activity, and that they feel that they get so much in return for this activity that they want to use their own spare time to engage in it. These employees can be described as innovation champions (Opland et al., 2021), and relates to ordinary employees how are so engaged in contributing to innovation that they go beyond what is expected from them in their job description and role.

At the same time, we also found traces of less developed and prominent innovation culture in the organization. This was especially tied to new employees, and several of these conveyed that until the first centrally organized hackathon they were not aware of how central these events were for innovation in the organization, and that this had not been clearly conveyed during on-boarding. The new employees who had been conveyed seemed to be those who had mentors who were especially engaged in hack

weeks or hackathons in the organization, or already knew about the hack event practices upfront from joining the company.

“I actually was very excited about the hack weeks as part of [company name] culture. I’ve always wanted to work at a place that gave employees and other team members the opportunity to just innovate for the sake of innovation.”

Based on the findings from the study, and on organizational norms of exploration as a characteristic of employee-driven innovation highlighted by Smith et al. (2012) in theory, we found that innovation culture is important to facilitate employee-driven innovation.

4.5 Hackathons and employee-driven innovation

In sections 4.1 to 4.4, we demonstrated that the use of hackathons in the studied organization coincides with the characteristics identified by Smith et al. (2012) as important to facilitate employee-driven innovation in organizations. We also identified behaviors and attitudes that enable or hinder the four characteristics of employee-driven innovation (see a summary of case-specific findings in Table 2). Based on our findings, we claim that hackathons can act as a facilitator for innovation activities in organizations, and that the stronger each of these four characteristics is supported in the organization, the greater the likelihood of employee-driven innovation to manifest.

	Leader support	Autonomy	Collaboration	Org. norms of exploration
Enablers	<ul style="list-style-type: none"> • Top-management allocates time for hack weeks yearly • Top-managers promise to reward the best ideas with opportunities for productization • Middle-managers usually free up employee calendars • Some managers participate in hack week demos 	<ul style="list-style-type: none"> • Participants are allowed to work on ideas and projects of free choice • Participants are allowed to form hack teams with whomever they want 	<ul style="list-style-type: none"> • Many participants discussing ideas with others • Many participants engage in teamwork • Some participants contribute to several projects by providing feedback, sharing contacts, or executing required tasks 	<ul style="list-style-type: none"> • Many employees recognize innovativeness and creativity as core values of corporate culture and reasons some joined the organization • Many employees are enthusiastic about and eagerly participate in hack weeks • Organizers of hack weeks put significant effort into making it a popular event
Hindrances	<ul style="list-style-type: none"> • Some winning ideas did not receive the promised follow up and support from the management • Some middle-managers book meetings during hack weeks • Some middle-managers prioritize ongoing tasks over hack weeks 	<ul style="list-style-type: none"> • Participants are encouraged to ideate and hack around a pre-selected theme • Execution of many activities is rigidly guided 	<ul style="list-style-type: none"> • Many participants choose to work solo • Some participants prioritize self-learning or development of own skills 	<ul style="list-style-type: none"> • Some employees do not know the values and norms of the corporate culture • Some employees choose not to engage in hack weeks

Table 2. Case-specific findings: enablers and hindrances related to leader support, autonomy, collaboration, and organizational norms of exploration.

In Figure 1, we present a conceptual model of design elements that reinforce employee-driven innovation in hackathons. In the model, we illustrate how the four factors from Smith et al. (2012) can be operationalized to unleash the innovation potential in organizations through appropriate design of the hackathons. We claim that in order to achieve employee-driven digital innovation in organizations,

practitioners must have a focus along all four dimensions, since the shortcomings found in any of the components in our study (see Table 2) have been found to have immediate impact on the employee-driven nature of innovation or the innovation potential.

Our model (Figure 1) has a direct practical application to practitioners who would like to facilitate employee-driven innovation through hackathons. The model helps to deliberately design the hackathons to maximize the innovation potential through the establishment of self-selected teams, appropriate arenas for idea sharing, fostering contributions across projects, and supporting company-wide advertisements of hackathons to generate enthusiasm. We believe that our conceptual model can be used as a basis for creating guidelines of how to organize hackathons in a way that does not hinder innovation or the driving force of the ordinary employees. At the same time the conceptual model can act as a starting point for other researchers aiming to research hackathons through focusing on employee-driven innovation.

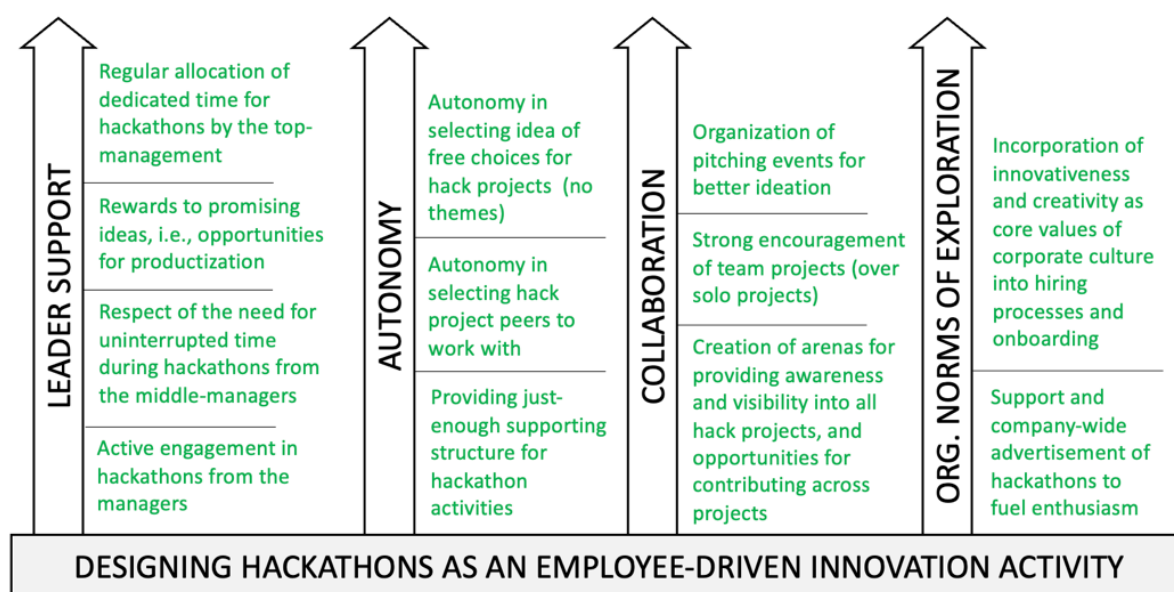


Figure 1. Conceptual model for facilitating employee-driven digital innovation using hackathons.

5 Conclusions

Through a case study, we have looked at how hackathons can be used as a facilitator for employee-driven innovation. To describe this relationship, we have used an established theory about characteristics of employee-driven innovation developed by Smith et al. (2012). Our findings confirm that leader support, autonomy, collaboration, and organizational norms of exploration are important to unleash the innovation potential located within ordinary employees in organizations. It must be emphasized that the basis for the products that have emerged from the organization used as a case has been digital.

We also argue that if properly organized, organization of hackathons can be an efficient way to demonstrate leader support for employee-driven innovation, enable autonomy and collaboration and establish an innovation culture based on the organizational values and norms of exploration.

Finally, it is fair to conclude that the absence of one of these factors might not necessarily prevent employee-driven innovation in the organization, but that the more prominent support of these factors increases the likelihood that hackathons can support company-wide employee engagement in driving digital innovation. These factors and hackathon design elements found in our study can thus be used as a framework to increase employee-driven innovation in organizations as shown in Figure 1.

Further research can see if additional factors from hackathons can be identified to support employee-driven innovation in organizations, even in organizations that are not based on digital products and services.

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