Organizing Open Digital Innovation : Evidence from Hackathons

Research-in-Progress

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Abstract

In this research, I study a novel open digital innovation phenomenon called hackathons. Hackathon, literally meaning a sprint of coding, is an open source programming competition for problem solving. Hackathons lead to self-organizing of a new group at the onset of a challenge, which questions a previously dominant imagery in organization studies that organization already exists as a static entity. The Information Systems (IS) scholars have recently started studying new organizational arrangements in terms of open innovation but we have paid less attention in emerging hackathon organizing. By taking a close look at this distinct environment for innovation, the study can provide a coherent account on the generative mechanism for open innovation and its relationship with the characteristics of digital technology. This research contributes to theory by looking at what transpires in this new organizing context for open digital innovation.

Keywords: Digital innovation, Open innovation, New Organizing, Digital Technology

Introduction

In this research, I study a novel open digital innovation phenomenon called hackathons. Hackathon, literally meaning a sprint of coding, is an open source programming competition for problem solving. The contestants gather in one place and form a team on the spot to create software in a very short amount of time, usually 24 hours overnight. They freely pitch ideas at the beginning and aggregate around the attractive ideas to work together as a team. Then they have to refine the suggested idea, decide upon functionalities and looks of the artifacts being produced, code the program on the way, merge separately written code lines, and finish testing and debugging, all under extreme time pressure. Google and Facebook have run internal hackathons regularly and invited outside developers. Hackathons lead to self-organizing of a new group at the onset of a challenge, which questions a previously dominant imagery in organization studies that organization already exists as a static entity. Whereas innovators in the hackathon have to find good ideas and qualified team partners to organize instantaneously, this boundary condition provides a good instance to capture the "becoming" process of an organization in the nascent stage (Weick 1995). Also, as the hackathon participants in principle collaborate without much information about each other's resource, the activities may require sensemaking (Weick 1995), establishing of task-related knowledge (Wegner 1985; Liang et al. 1995), assembling roles (Cohen 2013), and dividing labor (Lee and Berente 2012) very quickly.

The Information Systems (IS) scholars have recently started studying new organizational arrangements in terms of open innovation. Specifically, online innovation contests in the digital platform (e.g., TopCoder, InnoCentive, Kaggle) are being a central study subject (Boudreau et al. 2011; Jeppesen and Lakhani 2010). In this literature, economic incentives and rewards distribution, competition level, evaluation of idea

quality were main foci. On the contrary, we have paid less attention in hackathons given the wide interests from practice. How can a seemingly "disorganized" group of developers become an "organization" to create a well written piece of functioning software in such a short time?

This research centers on two specific questions from the technology and innovation standpoint. First, *how do hackathon contestants organize?* (RQ1) Digital technology has afforded new forms of organizing for innovation (Yoo et al. 2012; Zammuto 2007) and the IS research has constantly called for research into new organizing logic in the digital era (Sambamurthy and Zmud 200). Previous discussions on open innovation organizing have been on the governance in open source community (O'Mahony and Ferraro 2007; Shah 2006), developers' network (Singh and Phelps 2012; Oh and Jeon 2007), and group-level constructs such as effectiveness (Stewart and Gosain 2006) but not on its *emergent* process and what makes it possible. Exceptionally, Hahn et al. (2008) illustrate the emergence of new project teams, finding evidence from prior collaboration ties in open source developer networks which contrasts to our empirical setting. By taking a close look at this distinct environment for innovation, the study can provide a coherent account on the generative mechanism for open innovation and its relationship with the characteristics of digital technology.

Second, *how does the material and social nature of hackathon affect innovation process and outcomes?* (RQ2) Every open innovation development project has its own style guide and a set of conventions about how to write code, e.g., indentation or annotation, to retain a consistency. Given the time restriction, it may be more difficult to coordinate and communicate when more than one engineer code for the same system. The hackathon innovators are asked to use the cloud computing source code repository such as GitHub where they can store, import, merge, distribute, and write codes. Using this technology, this real-time interaction will engender distinct characteristics of innovation processes and the innovation outcome.

Due to the limited amount of previous research on open innovation that operates in real organizational settings, I conduct an empirically grounded theory building study through a qualitative approach. According to Van de Ven (1992), it is better to undertake real-time observations of events and activities when processes unfold in their natural field settings. Thus, I adopt field study as the most appropriate methodology to begin the inquiry. In so doing, I want to not only describe the occurrence of innovations, but also explain how the materiality of digital technology afforded such characteristics (Gibson 1979; Majchrzak and Markus 2013). This will direct us to theorize about the underlying generative mechanism that give rise to each event, not only the surface level of observables (Pentland 1999).

In what follows, I explain the unique ontological standing of the hackathon phenomenon and the rationale for my empirical investigation. I briefly present the conceptual background that informed and guided me in conducting of the research. Expected findings from initial Empirical observations follow. Then, I conclude with the implications.

Literature Review

Three realms of research compose the theoretical underpinnings. First, I see the relevant concepts around knowledge and distributed cognition. This will inform the overall theoretical background and help investigate how hackathon teams will enact, constitute, and use distributed knowledge in strict time constraints. Next, I see how the literature on small group has evolved. This will enrich the conceptions on the emergent organization in hackathons and reveal the issues associated with its properties. Last, I complement the literature review by looking at IS research dedicated to software development. This will be woven together as applicable as I present the initial findings in the subsequent sections.

Hackathon as Open Digital Innovation

The neologism hackathon was popularized by technology-driven companies like Facebook who has hosted hackathons every month, in which employees work intensively in small teams to build their own innovations into the currently operating platform. As the event is a fast-paced contest, Facebook and Google often use it as a recruiting tool to find prospects who "fit with the breakneck pace" of their corporate culture (Garling 2011). In an in-depth ethnographic study on Facebook, Fattal (2012) concludes the word *Hack* points to this company's internal cultural logic, reproducing the founding ethos as well as its management approach to seeking for better solutions. The concept of hackathon is in fact not

completely new to hacking community. They have organized independent fests dedicated to solving coding problems overnight, where they can boast and play with their programming skill. This has comprised programmers' subculture called hacker culture (Thomas 2003). Research on hacker conferences highlights how face-to-face encounters and collaboration in limited physical space help bond hacker communities often divided by geographic distance (Coleman 2010). This is consistent with a large body of the IS literature on software development teams) and Facebook's hackathon serves a similar purpose allowing coworkers to collaborate beyond their small team's tightly defined objectives (Fattal 2012). Also, as a ritualized side project, hackathon sparks excitement among employees, potentially reducing the risk of "job burnout" common in IT professions.

Traditionally, software development was deemed to be monitored and controlled by management (Choudhury and Sabherwal 2003; Gopal and Gosain 2010; Harris et al. 2009; Ji et al. 2005; Maruping et al. 2009). Abundant research on development methodologies evinces this view that effective methodologies do exist and can be identified (Fitzgerald et al. 2006). This stream has been particularly informative in assessing the team performance at a group level (Faraj and Sproull 2000; Guinan et al. 1998; Kraut and Streeter 1995). Similarly, IS literature on open source development has been majorly delineated by why open source developers participate in this voluntary activity (Aksulu and Wade 2010), which primarily looked into the individual level of motivation. Although these separate lines of efforts are valid in their own right, IS research is suffering a myopic view instead of demonstrating a holistic picture, without knowing in detail how individual designers come to interactively produce innovation in a team. Also, design environments are dramatically changing with multiple actors engaged in distributed development (Fitzgerald et al. 2006; Ågerfalk et al. 2009) affecting its diffusion and evolvement as well (Boland et al. 2007; Yoo et al. 2012). Consequently, static views on the organization and innovation can be limited in explaining complex phenomena that are embedded and bounded by contextual factors such as a temporal condition. Thus, I intend to turn our attention to the procedural analysis of innovation, from the emergence of an organization to its evolvement into a devoted unit constructing innovations on a strict timeline. This led me to the second part of the theoretical underpinnings.

Hackathon as New Organizing

Both hackathon and the emergent organization sketch a very unique organizational context, which complicates the theoretic framing of this study. Its temporary nature touches upon project-based organizations (Lundin and Söderholm 1995) and its observed attributes implicate the overlap with small group development (Tuckman and Jensen 1977). While these conceptions still hold to some extent, its internal dynamics do not resemble them as much as we wish, perhaps owing to its distinctive organizing logic and fast-paced, competition-pressured context.

A hackathon normally starts with the presentation of its purpose, requirements, judgment criteria, and prize arrangements. Although every team is geared toward winning the competition, only those selected will be declared winner or awarded, so the evaluation and decision about team partners and suggested ideas may become highly important. However, with its instant and simultaneous characteristic, the organizing process may take place without well-structured choice, coupled with the lack of information about each other's expertise. Consequently, the resultant organization may need to quickly make sense of what is going on (Weick 1995), identify task-related knowledge (Wegner 1985; Liang et al. 1995), or flexibly improvise to a certain extent (Weick 1998). Individuals may depend on intuitive "hunches" (Locke et al. 2008) or subjective assessments (Elsbach and Kramer 2003) rather than rational decision making. Given the time constraints, judgments must be made before actual products are produced or reliable information is available. Ironically, this uncertainty is a key element in mobilizing the emergence of an organization in hackathons.

It is important to note that this impromptu organizing reflects upon the new technology arrangements that are completely unprecedented (Yoo et al. 2010; Zammuto et al. 2007). Online communities rest on distributed organizing without a fixed membership (Faraj et al. 2011), multiplayer role-playing online games pursue task-based ad-hoc virtual teams (Huang et al. 2013), and collaborative digital artifacts enable us to envision emergency response groups in unexpected natural disasters (Majchrzak et al. 2007). This emergent group arises from a spontaneous process of group formation and is characterized as having no preexisting structure or prior experience of working together. Yet, these groups still express high levels of interdependence and coordinate knowledge, resources, and tasks (Majchrzak et al. 2007). How is this

possible? One explanation is through the lens of technology affordances. Originally put forward by Gibson (1979), technology scholars have adapted and developed the concept to explicate how the materiality of information systems, technological artifacts, and digital objects enact organizations' specific uses. In lieu of the IS research stream, the focus of the paper is not only on the organizing per se but also on how technology afforded its consequences (Majchrzak and Markus 2013).

Research Methodology

Due to the lack of previous research on open digital innovation operating in real organizational settings, I view it as essential to adopt a qualitative and inductive approach to the current inquiry (Gasson 2004; Strauss and Corbin 1998). In particular, I argue that previous, laboratory studies have been inadequate to examine two important features of organizing that occur in real-world settings. First, interpersonal judgments of hackathon participants' expertise typically involve dynamic processes that are strongly dependent on context (that is, they are subject to localized and situated norms and expectations). Second, these organizing processes unfold over time and involve extensive interaction among engaged actors. Traditional survey research designs and statistical analyses are static and therefore not readily suited to examining such dynamic and evolving phenomena. In contrast, qualitative research designs have been particularly well suited to analyzing dynamic, interactive processes (Lee 1994; 1999). By this reason, I chose qualitative logic to see organizing and creating innovation.

Interviews

The hackathon is a fast-paced environment where the observing researcher might miss out details or important observables so it is necessary to conduct semi-structured interviews afterwards. Interviewees were asked to recall and reconstruct the timeline from the beginning to end of the event, with interventions by the interviewer if applicable. Using the interview protocols prepared in advance, I first aimed to examine how the organizing unfolds during the hackathon. The interview started by asking the subjects to construct a timeline of their "typical" hackathon organizing process. Then, they were asked about each specific hackathon experience. The reason why I asked about the general and then went into details of specific ones is to avoid a potential pitfall of an interview method, which is the interviewee's tendency to make a story logical and consistent in the presence of interviewers who are "complete strangers" (Myers and Newman 2007, p. 4-5).

To minimize such risk and to let the interviewees speak their own, sometimes unpolished, languages, I spent a couple months trying to build a rapport with potential subjects in weekly meetings of civic innovators in the city of Philadelphia before actually embarking on interviews. This means that, unlike other qualitative interviews reported in the IS field which mostly studied corporate managers and IS professionals as an independent interrogator, the researcher and the subjects were not "complete strangers" in this study. Heyl (2001) explains the definition of ethnographic interviewing includes "having established respectful, on-going relationships, including enough rapport for there to be a genuine exchange of views" "to explore *purposefully* with the researcher the *meanings they place on events in their worlds*" (p. 369, emphasis added). In this inductive process, it is not possible for the interviewers to free themselves from their theoretical epistemological responsibilities.

A more critical reason why I took my relationship with the subject seriously is that it may influence the "quality" of the data. In qualitative research, there are a number of accounts about how to assess the quality of interviews and particularly, how "credible" the evidence should be. Methodological texts on interviewing have agreed that it is upon the source and the procedures by which it was produced (Schwandt 2001, p. 82, emphasis added). Thus, I anticipate the research will encounter two important issues: the spent time and the built relationship with the subject may well affect (1) the researcher's interpretation and verification of the subjects' intended meanings and (2) the interview (questioning-answering interaction) process itself. This indicates that what would be the most appropriate "distance" between the researcher and the subject will be a recurring question in the subsequent data collection.

Second, I asked the subjects' use of technological artifacts and skills in previous hackathons. A central focus was on what technological tools and how they used either for (1) design and development or (2) collaboration and communication. Considering the subjects may be potentially from diverse backgrounds in terms of areas of development (e.g., front-end, back-end, data visualization, prototype design),

technical expertise (e.g., programming languages, both specialty and proficiency, or operating systems), and roles (e.g., developer, organizer, concept pitcher, data provider), the questions were customized accordingly. Table 1 in Appendix explains how interview questions in the protocol were created for the initial round of data collection.

Archival Records

To supplant the field observation and interview data, I further sought to collect revision records and version history archived in the open source code repository of each hackathon team. By looking at textual data stored on the code repository, I could trace revision versions and times that match our interview data.

Data Collection

Sampling and Inclusion Criteria

I identified and contacted the potential subjects based on their expected contributions to theory development rather than for representativeness (theoretical sampling). They were selected based upon their expertise and prior experience in hackathons, for example, what projects they were involved in or their expertise (areas of development, languages, proficiency). To identify their background, a small set of survey questionnaires were given prior to joining the research. There were several criteria for choosing subjects and projects. First, the data from their hackathon projects that we need for analysis had to be publicly available, for example on the code-sharing website. Second, their core developers needed to be available for interviews. Also, I asked our identified subjects to recommend other teams or individuals available as well (snowball sampling). There was no financial payment or endowment for participating in the interviews. Table 1 shows the identified interview subjects at the moment.

Table 1. Identified Subject Profile			
ID	Subject (aliased)	Main Roles in Hackathons	Notes
#1	C. A.	Event Organizer, Developer	
#2	C. A. (another)	Event Organizer, Developer	
#3	L. E.	Event Organizer, Developer	
#4	K. C.	Developer	
#5	M. P.	Developer	
#6	I. C.	Developer	Teamed with #7, #8, #9 at a hackathon
#7	D. T.	Developer	Teamed with #6, #8, #9 at a hackathon
#8	H.	Developer (hardware)	Teamed with #6, #7, #9 at a hackathon
#9	K. M.	Business Planner	Teamed with #6, #7, #8 at a hackathon

Subjects #1 through #3 are central members of an open source community in the city as well as hackathon participants themselves, from whom I expect to hear more of the managing side of the story as hackathon event "organizers." Subjects #4 and #5 are free-lancing developers and serial hackathon participants who have much experience in development under unfamiliar environments. Subjects #6 through #8 worked together at one hackathon I attended as an observer (see next subsection), and they stated they did not know or barely knew each other until that day.

It should be noted that the subjects listed above share a socio-culturally similar background to some extent, which may have facilitated their communication in their first meetings or in doing of the undiscussed tasks. For example, they are all male and most of them in their 20's or 30's, and live in the same region in the United States. More importantly, because they were contacted via local civic hackathons where participation in public service and solving city problems are felt necessary, they may exhibit the same ethos toward open innovation.

Site

For an initial site visit, I attended one civic hackathon sponsored by one of the nation's largest telecom companies and a major funding agency. The event consisted of a two-day session, one night for idea pitch and networking and the other eight day hours for development and presentation. I counted the number of participants regularly to gauge the turnouts and possible dropouts. About 60 people remained in the next day while 80 stayed on average during the previous night's pitch. This is in part attributable to the event was rather open and informal although registration was recommended. A total of 12 teams were formed and competed finally, each of which had varying numbers of members ranging from two to six.

On site, I engaged in informal conversations with the hackathon participants. On the next day, I landed on two different teams to make observation, producing field notes occasionally. After the event, I obtained contacts of selected participants for subsequent interviews. Also, I gathered information on the web documenting the event, before and after, and complemented our real-time observation via photography and videography for archiving purpose. The interviews so far yielded more than 40 single-spaced pages of transcript data.

Expected Findings

Among the themes that emerged in the initial round of data gathering and analysis, I present expected findings and related concepts that emerged during the initial rounds of observation and interviews so far. Each subsection is presented in relation to the research questions RQ1 and RQ2.

How Do Hackathon Participants Organize?

Linking Distributed Cognition and Behavioral Knowledge

Regarding the cognition distributed among multiple actors within a hackathon innovation team, anthropological studies by Hutchins (1991; 1995) informed my perspective on knowledge and cognition. In these accounts, knowledge is distributed and cognition is socially and culturally constituted through ongoing everyday practice. This practice view has been reflected in the IS and knowledge management research, for instance in Orlikowski (2002; 2007) and Levina and Vaast (2005). I intend to use this lens to understand how the hackathon innovators enact knowledge as they dynamically engage in real-time interaction both using and creating technological artifacts.

Argote and Miron-Spektor (2011) affirm that the knowledge could be embedded in a variety of repositories, including individuals, routines, and transactive memory systems. Transactive Memory (TM) is a meta-knowledge on who has better expertise on what, which is believed to increase efficiency and effectiveness of a task group (Liang et al. 1995). However, for the TM to be recognized, organizations should not only learn who knows what but also decide who will do what (Jarvenpaa and Majchrzak 2008; Majchrzak et al. 2007). This necessitates not only the prior existence of TM but also the decision on the division of cognitive labor required for innovation (Lee and Berente 2012). Extant studies conceive of a step-by-step model in which knowledge is readily built first and used later. In this world, there are separate stages between establishing and applying TM to do the task. Even the model with a dynamic focus assumes a "cyclical" and iterative process composed of three sequential stages (Brand and Hollingshead 2004). However, this does not address the fluid nature of knowledge coordination in a more simultaneous setting.

The initial rounds of interviews with the team members hint at how knowledge about each other is constructed and situated. One informant (Subject #7) mentioned the situation when he first met the third person (Subject #6) among those who joined in his team: "I. (Subject #6) *was good at coding* and he had met K. (Subject #9) once, and I liked him." When asked how he knew about the third person's expertise, he described in detail about his pair coding experience during the hackathon. As they worked on the same repository, sharing each generated file and checking real-time improvements, he realized that the third person (Subject #6) was "logical", meaning the code lines do not have a conflict and would function without error. Here, without actually running the program, he could almost intuitively know that the code was well written because he also had the expertise in programming. This is contrasted with what we heard from the interview with the first person (Subject #9), who was not knowledgeable at computer coding. K.

(Subject #9), as a non-designer, did know I. (Subject #6) was good at coding when asked retrospectively he could not explain in detail but just stated that he had "heard" from other members. D. (Subject #7), a seasoned engineer, on the other hand, not only knew I. (Subject #6) was good at coding but also to what degree he was good at that job. The sophistication levels of TM constructed from a designer and a non-designer differed because of their difference in expertise of design.

We could see the quality of TM was dependent upon both the individual's applicable expertise and his or her additional ability to accurately evaluate that expertise, which was highly situated and sometimes hard to be verbalized. It is important to note that the knowledge used to judge each other's possible contribution, conceptually TM, was embedded in the material artifact they used (code lines and digital platform). By improving the quality of codes, Dave could enact knowledge about how to write codes better looking at the real-time code updates, constitutively updated the understanding of another person's expertise accordingly, and the system they were building could be improved at the same time.

By integrating the interview results and the observation notes, as the research evolves, I wish to address the shortcomings of the normative models by stressing more on the behavioral aspects of knowledge. For example, the iterative, cyclical imagery of time dimension would be inappropriate in a highly temporary organization like hackathon teams as the organizing happens one-time only. Rather, I propose that TM is enacted simultaneously through a series of practices of action. This echoes Weick and Roberts' view (1993) that actions can be knowledge.

How Does the Nature of Hackathon Affect Innovation Process and Outcome?

Linking Digital Technology and Organizing

Even much of the current theory still holds on to the conceptualization of jobs and tasks as the product of deliberate, goal-directed managerial action (Cohen 2013). There is ample evidence, however, even in very similar circumstances, organizations use the same technology to perform the same task but structure that work differently (Barely 1986). The hackathon organizing was indeed highly chaotic, for example, one participant failing to partner with anyone, one team still looking for a member as one person did not show up as promised, and another team not knowing what to produce until the official beginning. Roles and tasks were not even discussed in one team whereas another team was quick to identify, showing different paces and patterns.

Orlikowski (2002) maintained effective organizing is an enacted capability constituted in the everyday practices of activities in her piece on distributed organization. She defines organizational knowing as emerging from the ongoing and situated actions of organizational members as they engage the world. This will be my vintage point in studying the organizing in hackathon innovation teams. The specific focus will be on how meta-knowledge on each other's expertise is enacted through practices of minute levels of tasks, and in such processes how digital technology (code sharing online repository) would facilitate it.

A distinctive feature of this novel form of organizing is that the innovators are physically collocated but work on the completely different parts in the development (e.g., software and hardware, front-end development and back-end development). For instance, in the case of pair coding, which is the most common case, they are present at the same place and time but they work on the codes separately in an independent technological setting (but still connected and the outcomes synchronously shared via the Internet). On the contrary to our initial belief that the innovators will need to identify task-related knowledge to divide roles and tasks due to the lack of previous experience together, they implicitly knew where to contribute by self-selecting task division. This is essentially possible because of the architecture of the digital artifact they create – computer programming can be *modular*.

The code architectures of products produced through open source model is often claimed to be more modular than those written within organizations (O'Reilly 1999; Raymond 2001). MacCormack et al. (2006) explains this is because, the sharing of information about solutions adopted in different parts of the design is much easier and may be encouraged due to the physical proximity in "proprietary" development model. In lieu of this, research on open source development emphasizes creating common grounds (i.e., knowledge sharing) among individuals to enable coordination (Hinds and Kiesler, 2002; Srikanth and Puranam 2011) with a stress on the "lack" of face-to-face interaction. Consequently, in many of these accounts, importantly studied is the role of collaborative technologies such as email, bulletin

boards, and version control software (Lee and Cole 2003; Raymond 1999; Shah 2006). Consistent with this view, media synchronicity theory (Dennis et al. 2008) argues that the more synchronous communication channel will create richer messages. The hackathon innovation creates an interesting tension here, as it is a distributed work environment where tasks are highly modular but knowledge sharing through face-to-face interaction is readily possible and thought be necessary to coordinate.

However, on the contrary to the previous theories, there was little knowledge being "shared" about the overall system being developed although there was a highly synchronous channel available. Participants are clearly aware of their tasks and their possible contributions although they did not explicitly set a goal, do not have trust derived from prior experience as behavioral and psychological scholars may argue. Of course, the availability of electronic communication technologies is no guarantee that knowledge sharing will actually take place (Alavi and Leidner 1999; Orlikowski 1996). To elucidate this, existing knowledge management research has supported and reinforced the belief that individual motivation matters (Wasco and Faraj 2005). Surprisingly, however, without much discursive communication as well as shared future plans and previous commitment, the hackathon innovators were able to collectively accomplish the production of a complex artifact (the software) very successfully (for affirming evidence, see Bolici et al. (2009) and Bruns (2013)). Looking at the behavior of a group level, they seemed to be cooperating in an organized and coordinated way; yet at an individual level, they worked alone as if they have an independent task. This contrast between the individual and the collective level is somewhat analogous conceptually to what is called in behavioral biology the coordination paradox or "stigmergy" (Grassé 1959; Theraulaz and Bonabeau 1999). I opine that the paradox was particularly made possible due to the characteristics of the product they produced and the method they used, i.e., digital technology.

It is noteworthy that this pattern change towards the end of the competition as they had to merge the separately produced codes, thus resulting in integrating individual tasks accordingly. In the last-minute debugging processes, there was dramatically high interaction and negotiation over the codes and features to meet the timeline. In this stage, cooperation was constituted by the increased interdependence of the designers who changed the state of their previously modular tasks, and interact on a common field of work (Schmidt and Simone 1996, p. 158) on the repository.

Taken together, although previous conceptions on small groups and organizing provide all adequate illustrations in their settings, integration of inconsistent views will yield illogical reasoning since underlying assumptions and orientations significantly vary. Hence, I am cautious about applying extant theories crudely. While I recognize the relevance of prior recounts, I want to offer theoretical support for a distinct mode of organizing that hackathon-based open innovation is based upon. The emergent organization coalesces and disbands very quickly and exits only shortly, and I have seen this boundary condition will weaken and modify prevailing assumptions held in mainstream organization theory, e.g., structural roles, coordination, knowledge transfer.

Concluding Remarks

The hackathon phenomenon is as an excellent opportunity to look at how digital technology affords a novel form of organizing and how it characterizes the nature of innovations. It begets a new innovation context bounding different conditions to organize, particularly temporally. The actors show different patterns even to achieve the same goal than do traditional organizations, where I find opportunities for theory development.

This research contributes to theory by looking at what transpires in this new organizing context for open digital innovation. As Dougherty (2006) puts, organizing for innovation should be defined in its own terms, not in terms of the deviation from the conventional model. We study when and under what conditions innovation would emerge, facilitated by focal technologies such as git, and this adds to the IS literature.

From a practice view (Feldman and Orlikowski 2011; Orlikowski 2000), this field study advances the managerial understanding on under what conditions uncoordinated individuals to become coordinated. Especially, I believe potential insights can be transferrable (Myers 2013) to existing sorts of organizations as well, e.g., newly created technology venture firms. Entrepreneurial organizations in the nascent stage can benefit from our study as we explore how hackathon innovators enact ability to coordinate in a very instantly organized setting. Hackathon innovation challenges let participants develop IT artifacts very

quickly. They should make sure that the prototype does not function erroneously, and if ever, respond and discuss quickly within the team. It echoes the latest efforts made by startup incubators and venture capitalists: Y-Combinator, AngelHack Accelerator, and StartupBus are sponsoring hackathons to locate funding targets as well as to test the team members' organizing capability to turn the new ideas into decent software.

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