

CO-DEVELOPING AGILE STAGE-GATE IN DANISH SMES

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ABSTRACT

Existing research on participatory innovation mainly investigates collaborative processes of new product development between innovative organisation and users. In this paper, we contribute to research on participatory innovation by focusing on the co-development of new process development, rather than new product development. Overall, our study outlines the potential of a participatory innovation framework for new process development in which a co-developing network participate in planned interactions that (1) fit the purpose of the project and (2) includes opportunities for by-product interactions and meanings that emerge in and across participants in between the planned activities.

INTRODUCTION

Ideas, resources and individuals flow in and out of organisations as organisations increasingly rely on external sourced throughout their innovation processes (West et al. 2014). Organisations navigate dual relationships between innovators and end users (Spohrer & Maglio 2008) and stakeholder interactions within communities and networks (den Hertog 2000; Kazadi et al. 2015). The theory on collaborative and open innovation is still developing, and participatory innovation is one of the streams of studies on collaborative processes of new product development (Greer & Lei 2012). Existing research on participatory innovation mainly focuses on programmed projects with the aim of their purposeful management (e.g. Buur &

Larsen 2010; Buur & Matthews 2008; Buur et al. 2013) although, participatory innovation is subject to both planned and emergent events (Buur & Larsen 2010). Therefore, existing research on participatory innovation has yet to uncover how emergent phenomena unfold and are intertwined with planned activities when innovative organisations interact with each other and with researchers to innovate their processes (Buur & Larsen 2010). In this paper, we investigate the co-development of an approach to new product development, rather than new product development itself, and emphasising both planned activities and emergent events. We do so by evaluating through the participatory innovation framework (Buur & Larsen 2010; Buur & Matthews 2008) the process of co-developing an Agile Stage-Gate approach suitable for manufacturing SMEs in Denmark. We therefore focus on the research question: how does a group of innovation organisations and researchers co-innovate to develop an ASG approach suitable for manufacturing SMEs in Denmark?

THE CO-DEVELOPMENT PROJECT OF ASG FOR MANUFACTURING SMES IN DENMARK

ASG is a hybrid innovation model that combines a traditional gating approach with the so-called Agile methods. Agile innovation, specifically, became popular as a new software development method thanks to its ability to respond to customers and accommodate fast time-to-market (Highsmith & Cockburn 2001; Anon 2001). Prescribed, related and often parallel activities compose the Agile method, while the Stage-Gate model stipulates a disciplined and structured approach with predetermined stages and divided by gates (Cooper 1994). The ASG model, just as the traditional Stage-Gate (Cooper 1994), is a prescriptive model and aims at providing an effective and efficient methodology for new product development (Cooper 2016). Existing research in lead using organisations indicates that ASG methods work well in manufacturing firms (Sommer et al. 2015). New product development processes, such as ASG, requires changes in the way an organisation works (Gregory et al. 2015; O'Connor 1994) and may create tensions within organisations. Organisations usually cooperate closely with consultants throughout

the development and implementation of ASG methodologies (Sommer et al. 2015). Nevertheless, existing research on ASG has mainly focused on developing and discussing normative one-size-fits-all models, and has yet to evaluate the collaborative development and implementation of ASG methodologies.

The co-development project that we investigate started in early 2016 when the confederation of Danish Industry (DI) launched the collaborative project. The project involved four parties: (1) a private consulting firm specialised in innovation management; (2) academic researchers (3) three Danish SMEs; (4) a reference group of innovation managers from large manufacturers who had previous experience with agile and stage-gate based new product development (later on referred to as the expert group). The three SMEs are manufacturers and produce high-end microphones, convenience frozen food, and Doppler radars. By August 2016, DI sent out a call for companies to test ASG approach and during fall of 2016, three companies were selected. Overall, the project included five workshops from the fall 2016 to the fall 2017.

During workshop 1 in October 2016, the expert group was instructed in Stage-Gate® by Robert Cooper and Agile methods by the consultants. DI and researchers also participated in the workshop. Experts had received a description of ASG in advance and asked to consider the general strengths and challenges of Agile Stage-Gate. DI facilitated a session in which participants discussed the ASG methodology and its strengths and weaknesses by working on flipcharts by the participants. The facilitators then presented typical challenges of Danish SMEs, and divided the experts into three groups with DI, consultants and researchers to discuss the most important elements for the adapted ASG approach to be successful and write five recommendations on large prepared posters. Between workshop 1 and 2, DI, consultants and researchers co-developed a first version of the ASG approach and wrote a description of it, building on the discussion and feedback from workshop 1. In December 2016, DI organised and facilitated, together with the consultants, workshop 2 (SMEs were not present). After presenting the first version of the adapted ASG approach, the facilitators asked the experts and Robert Cooper (video link) to discuss in groups the approach and its challenges in relation to the selected SMEs. Each group was asked to discuss and propose solutions to five predefined challenges (e.g. “How to ensure dedicated teams in SMEs, using agile software methods on hardware”), which the organisers of the workshop illustrated on posters. Workshop 3, in January 2017 was the official kick-off for the three Danish SMEs, during which DI and the consultants introduced them to the ASG approach and started training them for its implementation by planning their project based on ASG. The SMEs left the workshop with a concrete plan

for the next steps. At this point, the project entered the test phase, during which the SMEs would apply the ASG approach in their own new product development process. In addition to the workshop, the SMEs received individual training and coaching by the consultants and DI in this phase. In May 2017, workshop 4 emphasised halfway experiences from the three Danish SMEs. Here the SMEs presented progress and experiences with the ASG approach. DI and the consultants presented their own experience with teaching and implementing the first version of the ASG approach. All participants (including the researchers) identified hot topics in relation to the approach, and discussed them in groups to outline potential counter measures in the next versions of the ASG approach facilitated by posters. Each group then presented their discussion, and participants synthesized the results together. In the third quarter of 2017, each SME was the subject of an evaluation workshop, in which participants presented their impressions on applying the ASG approach for the selected new product development processes. During these evaluation workshops, DI, consultants and researchers discussed the implementation of the ASG approach with the employees of the SMEs that were responsible for the ASG-based new product development processes. At the end of October 2017, workshop 5 took place: the expert group discussed the results from the implementation of the ASG approach and, building on these results, DI, consultants, researchers and the expert group worked together to co-develop an updated version of the ASG approach and a related toolbox to support implementation in manufacturing SMEs.

LITERATURE AND THEORY

Participatory innovation concerns the scaffolding of ordinary people in their ability to contribute to innovation. Participatory innovation processes involve a combination of planned, goal-oriented activities (Buur & Matthews 2008) and emergent conversations (Buur & Larsen 2010) throughout on-going collaboration between developers and users. A participatory innovation project includes five types of activities, roughly, in the following sequence: field study, sense making, co-ideation, business modelling and co-design. Typically, a cross-disciplinary innovation team organises these formalised activities and initiates interactions between participants. Planned, dedicated activities span across new product development processes and serve a double purpose: (1) generate knowledge about customers and users in a way that stimulate developers to reflect on product, producer role and company identity; (2) generate business opportunities that relate to the market in the form of product concepts (Buur & Matthews 2008). Organisations working with participatory innovation face four key challenges: the developers’ perception of

users; the different time horizons of involved parties; the conflicting schedules and resource allocation priorities; and the not-invented here syndrome (Buur & Matthews 2008). These challenges characterise the emerging exchanges between parties throughout participatory innovation processes, and influence the rise of new meanings between parties. Shared goals may emerge between parties, but what is important is the quality of interaction. In this view, innovation is understood as a result of the negotiation of crossing intentions between participants and participatory innovation becomes a framework to facilitate interaction between parties with diverse needs and expectations (Buur & Larsen 2010). Nevertheless, existing research on participatory innovation is prescriptive in nature as inspired by design research (e.g. Buur & Larsen 2010; Buur & Matthews 2008; Buur et al. 2013). Existing research on participatory innovation mainly investigates collaborative processes of new product development between innovative organisation and users, and focuses on programmed participatory process innovation with the aim of its purposeful management (e.g. Greer & Lei 2012; Kazadi et al. 2015; Buur & Matthews 2008; Buur et al. 2013). However, innovative organisations collaborate not only with users, but also with each other, to develop their innovation methods and approaches (Kazadi et al. 2015) and are subject to both planned and emergent events (Buur & Larsen 2010). In this study, we use field study, sense making, co-ideation, business modelling and co-design (Buur & Matthews 2008) to characterise the planned activities and investigate their unfolding in the collaborative development under investigation. In addition, we study emergent conversations and events over time (Buur & Larsen 2010) to obtain a descriptive, process account of the co-development of a new product development approach such as ASG for Danish manufacturing SMEs.

DATA AND METHODS

We investigate the process of collaboratively developing an ASG approach for Danish SMEs by focusing on the interactions between parties throughout the planned activities as analysed through the lens of participatory innovation. We longitudinally studied the participatory innovation of the ASG approach for Danish SMEs throughout 2016 and 2017. We followed process methods and employed a transactional view of time, according to which time is divisible and differentiated. We applied the critical incident technique (Flanagan 1954; Wright et al. 2000) and considered time as dependent on its observers. Data collection included participatory observation, interviews and desktop data collection. Participatory observation covered the planned activities between participants, which we documented through notes and recordings. Moreover, we carried out one interview in each SME with the front-line employees who were directly

involved in the ASG-based new product development processes (without their managers). In these interviews, we used Event Modifier Assessment (Edwards & Winkel 2016) workshops and had the participants map a timeline of all significant events in the period. The purpose was to map significant events and identify which were part of the ASG-project to allow us to assess ASG events separately.

Throughout our data collection, we asked the participants in the ASG project to map the ASG project on timelines on which they outlined milestones and phases based on their own perceptions (Langley et al. 2013). The aim of this approach was to determine critical events and measure time by identifying what participants deemed to be significant, instead of mapping the participatory innovation process against the predefined project plan and schedule, (Van de Ven & Poole 2005). Such events included planned and emergent activities associated to the ASG project along with any other occurrence that observers identified as critical in the unfolding of the co-development. Examples of planned critical incidents were the participatory workshops, while an emergent critical incident was, e.g., the involvement of one of the consultants in one of the SMEs' project beyond the activities planned for the ASG training. The critical incident technique allowed us to map, document and analyse all phenomena that would evolve across field study, sense making, co-ideation, business modelling and co-design of the participatory innovation process under investigation (Buur & Matthews 2008).

EVALUATION OF DATA

Overall, the study aimed at versatility rather than statistical generalisability (Lee & Baskerville 2003). In fact, we extracted results through a combination of critical incident technique (Gremler 2004) and theoretical sampling (Eisenhardt 1989), as the SMEs were selected collaboratively by the project participants as comparable cases in which the ASG process could be transparently observed to extend the emergent ASG approach to small and medium sized manufacturers. This supports the applicability of results beyond the investigated case (Lee & Baskerville 2003). Furthermore, the direct involvement in the ASG participatory innovation process allowed building interactional expertise, which supports interpretative validity through a closer understanding of practitioners' language and attitudes (Langley 1999).

RESULTS

Throughout the project, participants worked together across two steps aiming at co-developing an adapted ASG approach for manufacturing SMEs in Denmark. The first step consisted of the preparation for the project and the first two workshops with DI, consultants, researchers (including Cooper) and the expert group.

The field study began along with the project in 2016 when DI began working together with the consultants and researchers to develop the ASG approach. ASG was adapted from a North American hierarchical large corporation perspective to a Danish context, in which power distance and hierarchy are both very low. The purpose of the first step was to ensure that ASG approach was tailored for Danish SMEs, and that it considered their scarcity of resources and lack of dedicated new product development departments. During workshop 1, the participants explored the ASG methodology and the experts mapped ASG to their experience and understanding of SMEs. The participants co-developed a first version of the adapted ASG approach, resulting in sense making of ASG. Interactions were open and honest, as the expert confronted the theoretical approach of DI, consultants and researchers with their practical experiences with the ASG methodology. Workshop 2 investigated the adapted ASG approach against the context of the SMEs. As in co-ideation, this process included a constructive discussion centred on the SMEs perception of their potential in relation to ASG. Thereby it generated ideas for improving the ASG methodology based on the users' practice. The outcome of workshop 1 and 2 was a first approach to ASG in the intended context akin to business modelling. In addition, this first participatory innovation step composed of field study, sense making, co-ideation and business modelling was a first version of the adapted ASG approach, presented in a 20-page manual.

The second step was an unexpected local adaption in the three SMEs. Starting with workshop 3, the SMEs received training and coaching on the ASG approach. Yet each of the three SMEs changed the ASG approach to fit their situation. This appeared to be connected to a variety of emergent events, such as the involvement of one of the consultants in the user study of the convenience frozen food producer (the planned interaction only involved training on how to carry out the user study). The radar manufacturer adopted time-boxed development to a two-week sprint followed by a week development break to catch up on pending tasks e.g. support production. The microphone company modified the dedicated team of developers to a developer with a team of discussants. These changes represent emerging co-design instances in which the users of ASG modify the co-developed approach to fit their situation and pre-conditions. This individual adaptation allowed simplifying the co-developed ASG approach by reducing it to the key elements as identified by the participating SMEs. The co-design, however, was only fed back into the ASG approach in workshop 4, during which the SMEs openly discussed their experience with the other participants. In fact, results from workshop 4 were comparable with the evaluate interviews carried out by the researchers with the SMEs

employees who actually worked with the ASG approach. The outcome of the co-design was integrated into a new version of the adapted approach. DI, consultants and researchers then presented this co-designed version to the expert group at workshop 5 in October 2017, during which yet another round of co-development took place. An emergent conversation added an unexpected outcome to the planned outcome of workshop 5, as the expert group ended up proposing a variety of potential developments of the ASG project for the future on top of providing feedback on the adapted approach.

DISCUSSION (AND CONCLUSION)

Our study shows that participatory innovation can be applied to new process development, which extends the applicability of the original framework. In our study, developers included representatives from the manufacturing industry, consultants, researchers and experts in the field of the new process development under development. They met and worked together in dedicated workshops through various iterations of field study, sense making, co-ideation and business modelling, building on the continuous dialogue with the innovation recipients. In the co-design phase, recipients applied and adapted the co-developed approach to their own needs and context by navigating through emergent conversations and events, which then fed back into a second version of the ASG approach. This set up allowed focusing on standardization by considering similarities and differences of the heterogeneous recipients, while also emphasising customisation thanks to the closer involvement of recipients in the co-design. Overall, our study outlines the potential of a participatory innovation framework for new process development in which a co-developing network participate in planned interactions that (1) fit the purpose of the project and (2) includes opportunities for by-product interactions and meanings that emerge in and across participants in between the planned activities. Our study contributes to the participatory innovation framework by seeing past its originally prescriptive nature, and revealing its potential as analytical model. This study is not free of limitations, and aimed for versatility rather than statistical generalisability. Future research should thus evaluate the applicability in other contexts.

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