Fostering Continuous Innovation with Engaging IT-Assisted Transparent Information Sharing: A Case Study

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Abstract. Continuous innovation (CI) in large, established companies aiming to both produce incremental innovations as well as to create more radical ones is complex and complicated. It is affected by many simultaneous hard and soft factors and interrelationships. One suggested way how CI performance can potentially be improved is by increasing transparency in the innovation process, through which better employee participation to the process can possibly be achieved. Modern information/knowledge management and sharing IT tools can support that in practice. In this paper, we investigate those questions in an industrial software-intensive B2B company case. The company augmented its former, formal stage-gate based innovation process with new practices in order to accelerate the business innovation decision-making with validated information. We collected empirically rich qualitative and quantitative data and analyzed it to extract a set of statements grounded on the data. Those statements suggest that it is central to engage and connect right people and key information for effective and efficient idea generation, idea development, and business incubation. However, in different phases various stakeholder feedback and expert knowledge are critical for successful innovation progress. Increased transparency supported by integrated and versatile innovation, and knowledge management IT tools can intensify them. In effect, the clock speed of the organization for connecting people, ideas, knowledge (even tacit), and business decisions is accelerated. Overall the CI process should be flexible but at the same time it should frame the central direction. Consequently, it is hard to measure CI performance fully decisively with traditional KPIs.

Keywords: Continuous Innovation, Innovation Performance, Idea Management System.

1 Introduction

Companies producing software-intensive solutions are living in a rapidly changing market environment, where they have to continuously look for ways how to efficient-

ly produce new appealing products and services for various customers while sustaining their current products and businesses [1]. This is not straightforward for B2B technology companies developing complex technical solutions, which need to be maintained throughout their typically long life spans.

For achieving business-driven innovations in which technology push and market pull are high, it is suggested that companies should evolve towards high-speed experimentation and continuity in their innovation [2]. Continuity should be developed in a way that supports both the company's operative efficiency and profitability in their current business, and also the flexibility to develop their future business opportunities. The continuous innovation approach has been proposed for binding the operational and strategic planning processes closer to each other, and for providing a way for continuous and efficient contribution to the company's strategic planning activities [3]. Experimentation, on the other hand, is an approach that supports radical rethinking of ideas and early collection of feedback to cope with high uncertainties related to new business ideas.

To achieve continuity and radical innovations, it is suggested to increase the stakeholders' participation in innovation, remove the bottlenecks in the innovation process and adopt an experiment-driven approach [4, 5, 6]. Organizational structures and innovation management systems should support those [7]. Knowledge transfer and learning are essential elements of continuous innovation [8].

Transparency has been identified as one contributing factor for continuous innovation [9, 10]. However, it has not been widely studied how it actually affects innovation process performance. There appear to be few empirical studies on how transparency of information is facilitated in order to gain positive process performance effects (e.g., [11]). Moreover, it is important to realize what particular information and knowledge should be managed and shared transparently between different actors [8].

We have been investigating those topics with a case study in one industrial company. This paper is the continuation of our prior work with the case company [12]. The earlier paper described how transparency of information is realized in our case company's continuous innovation practice and examined performance measurements with selected key performance indicators (KPIs). The objective was mostly descriptive, concentrating just on the particular company situation while generality was not of primary importance. This paper advances from that point of view by taking a wider and more in-depth view at the collected research material to conceptualize and frame the findings in order to draw more general conclusions, informed suggestions, and propositions for replicating studies. We also widen our longitudinal research scope by several months, in total ranging now from February 2014 to October 2016, spanning 33 months in the company. During this time, several data collection occasions and frequent observations were made by the researchers together with the case company representatives. In this paper we are thereby interested in the following research questions motivated and informed by our prior work:

- RQ1. *What factors affect continuous innovation (CI) performance?*
- RQ2. *How does transparency impact it?*
- RQ3. *What is the role of IT tools?*

The paper is structured as follows. In Sect. 2, prior research and motivation for this research are outlined. The case research design is explained in Sect. 3. Sect. 4 presents the empirical results followed by analysis and discussion in Sect. 5. Finally, Sect. 6 concludes the paper, suggesting further research.

2 Background

2.1 Continuous Innovation

Modern software-intensive companies are inclined toward continuous improvement particularly in conjunction with agile and lean software development methods. However, in many current business environments more than that is needed: innovation, even continuously. Companies should be able to innovate overtime consistently and in a sustained manner [13].

In what is called Continuous Innovation, continuous improvement, learning, and innovation are converged [14]. The overall goal of continuous innovation capability is to enable ongoing interaction between operations, incremental improvement and learning (exploitation processes), and radical innovation and change (exploration processes) [15]. The key principle of continuous innovation is that it is integrated into the daily work of the organization [16]. Relevant research questions are then how continuously innovative organizations look like (processes, technology, people, organization and management), and what can be learned from the change process of successful development of continuous innovation capability [15].

In general, industrial innovation involves many challenges related both to the ideation and the implementation [1]. Incremental (sustaining) innovations are improvements exploiting the existing knowledge while radical (discontinuous) innovations require exploration and new knowledge acquisition. Realizing both needs ambidexterity in the capabilities to get flexibility in decision-making and conducive culture.

Established firms may have challenges in responding to and generating discontinued innovations when their idea screening processes filter away discontinuous ideas, and because the idea management is aimed at generating patents only [17]. Advancing from incremental product innovation only to further the business model, discontinuous and open innovation requires balancing of open-mindedness and visibility of innovation, but in a structured way to avoid chaotic ideation [5]. Organizational change management should promote innovativeness by considering knowledge an asset and a resource, and developing future awareness for innovation orientation [18].

2.2 Innovation Performance

Innovation, in particular continuous innovation, should be actively managed and measured with performance measurements linking innovation performance to firm performance [16]. Such comprehensive measurement frameworks require conceptualizing the innovation capability. Innovation capability is suggested to cover the poten-

tial (e.g., know-how, organizational communication and culture, individual creativity), the processes (systems and activities), and the results of innovation activities [19].

Continuous innovation measurements should be multidimensional and integrated, focusing on the company-specific business success factors (business innovation capability) [16]. Such potential measurement items could be, for instance, leadership toward continuous innovation, employees' idea generation, employees' expertise, and internal processes supporting and reflecting continuous innovation.

Fostering and sustaining innovation consistently over time requires a comprehensive view of innovation, comprising the innovation capability (inputs, activities, determinants), innovation outputs, impacts on performance (direct, indirect), and learning (feedbacks) [13]. However, there is a lack of empirically validated innovation metrics and measurement models.

2.3 Transparency

In the context of continuous innovation, transparency concerns in particular visibility of relevant information and knowledge of innovation targets, ideas, and the innovation activities. When product ideas, features, and their related information are visible in real time, including links between the different items, generated ideas may trigger new ideas [5]. Moreover, transparent idea feedback channels and traceability facilitate idea maturation. In addition, visibility of innovation metrics provides transparency to the internal workings of the organization's innovation process [13].

Transparent sharing and communication of internal information and knowledge, such as open dialogue of company's vision, strategy and innovation targets and re-exploring of existing ideas and concepts, may improve innovation performance [18, 20]. Potential measures of innovation capability thus include communication channels [19].

2.4 Innovation Management Systems, Information Sharing and Knowledge Management IT Tools

Modern IT tools enable systematic and efficient handling of ideas by making it highly interactive [17]. Such idea management systems give structure to the early phases of the innovation process. Searchable idea banks make it rational for ideas to be refined, exchanged and re-used in different projects. Discontinuous ideas can be stored and (re)used later. Information and knowledge management IT tools can support different views of information based on the needs of the teams, project managers, and product management, visible globally in real time [5].

Collaborative IT platforms promote and stimulate idea generation and employee engagement, and they can even serve as management tools for creativity [20]. Virtual idea campaigns and virtual innovation spaces encourage and enable all employees to participate. Moreover, such platforms give critical experts the opportunity to contribute on right times in the idea development process [5].

Overall, knowledge management IT systems can support organization and innovativeness development by making organizational knowledge actionable [18]. However,

notably, IT barriers for information sharing and knowledge utilization could also hinder innovativeness. More research is needed to understand the impact of collaborative tools on idea generation and innovation development, and on the impact of IT on knowledge sharing in the innovation process for firms' innovation capability [20].

3 Research Design

3.1 Case Account

The case company is a B2B provider of embedded systems for the wireless industry, having around 30 years of expertise in advanced radio communication technologies with more than 500 employees in four countries. The company had used the traditional stage-gate model for their ideation well over ten years [21]. In the stage-gate innovation process, the collected ideas focused only on creating intellectual property rights (IPR), which was confidential information and which involved only a limited number of experts. In general, there were challenges with the daily operative work, which did not allow designers and experts to participate much in the innovation.

The used tools and processes were inadequate for continuous idea handling and instead the innovation process was based on heavy control mechanisms and decision making procedures. Without a common, well-known practice to present ideas for business decision makers, and without well-defined criteria to assess the potential business value of the ideas, the quality of the ideas varied a lot and missed the link to company business targets. Consequently, the lead time of idea handling varied as well and many of the ideas remained unresolved. All this decreased employees' motivation to propose ideas. There was a real need to increase the amount of ideas, especially in the areas which were significant for company strategic business targets.

During the research period the company went through a big organizational change in which a significant part of the company was divested to another company. This provided the company a unique and excellent opportunity to renew its innovation processes, and revise their business strategies in a large scale. This also made the company an excellent sample for this research as the single-case study.

To improve the abovementioned situation, the company set a grand innovation strategy to have more radical innovations (products or applications) to scale the business by utilizing the full potential of the entire organization. The improvement focused on radical new business innovations but covered product and process innovations as well [21]. First, the company decided to adopt a more experimental approach in their idea harvesting, focusing, and validation. It was assumed that employees who work daily in operative work have many good ideas, which could support the company's business planning, but in the beginning there was no way to collect them. It was assumed that increasing the transparency of the innovation process and making it more agile with experimentation as well as adding frequent screening practices would lead to a greater number of harvested ideas and an improved idea fit for the company's business targets. As a consequence, it was expected that this would increase the overall innovation performance in the company and lead to achieving of more radical business innovations. The concrete targets of the improvements are shown in Table 1.

Table 1. Case company innovation process improvement targets.

Target	Description
T1	Harvest more ideas within the company
T2	Grow ideas faster into business innovations
T3	Capture ideas with better fit for purpose
T4	Improve the participation of various company stakeholders in the innovation process

In order to measure the impacts of the improvements on continuous innovation performance, the company set up the following KPIs (Table 2).

Table 2. Case company KPIs.

KPI#	Definition
KPI1	Number of harvested ideas (T1 in Table 1): *Continuous number of ideas*
KPI2	Number of people participating in the innovation process (T4): *Number of people who participated in the processing of ideas*
KPI3	Quality of ideas in the idea pool (T3): *Number of ideas in business validation*
KPI4	Throughput from idea to business innovation (T2): *Cycle time of an idea (from idea to potential business case demonstration)*
KPI5	Frequency of business innovations growing from the idea database (T2): *Frequency of potential business idea demonstration*

Several actions were conducted to improve the innovation practices in the company [21]. Fig. 1 illustrates the timeline of the observation period during which the improvement actions were conducted.

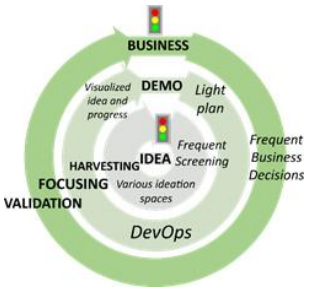
The first step in the journey of improving continuous innovation was the deployment of an innovation management information system tool for collecting all ideas and covering the innovation process from idea harvesting until the business validation. The tool system makes the ideas, their current status, and related information continuously transparent to stakeholders. The tool provides important support for the process implementation. The KPI data collection and follow-up is automated in the tool system. In this paper we call it as the *Ideas Tool* (idea collection, ideation, idea management tool [21]).

Fig. 1. Timeline of the improvement actions in the case company.

Another significant change in the innovation approach was that the continuous innovation process was copied to various places across the organization to support idea

creation on a local level. The company began to call this approach as a ubiquitous ideation approach. This meant that ideas could also be submitted directly to a product program where they were handled first, e.g., in epic evaluation before moving to relevant development backlog.

In summary, the new continuous innovation process of the case company included three main phases: idea harvesting, focusing, and validation phase (Fig. 2). This process also illustrates the maturity of individual ideas.



In the idea harvesting phase an idea is a simple, textual description – no more than a couple of sentences. When idea evolves and enters the demo phase, idea is already more focused and able to provide proof of concept solution that can be demonstrated. Entering the demo phase requires business decision (so called "traffic light feedback") although demos are lightweight and not involve more than 2-3 days of work. After the demo is successful and it is agreed that it employs business potential, the idea is ready to enter the final validation phase. Therein, an R&D project is established following company's end-product-process guidelines in order to develop a product or product improvement targeting a real, selected market segment. Entering the validation phase i.e., R&D project, requires business decision as well as naturally project plans, resource and cost estimates.

Fig. 2. Continuous innovation process of the case company.

3.2 Methodology

The main approach for the research is an exploratory single-case study [22, 23]. The research is longitudinal, spanning Q2/2014 to Q4/2017. The case company provided a possibility to investigate the continuous innovation phenomenon deeply and measure it throughout the process. This made it possible to discover different performance influencing factors in practice and to evaluate the performance effects during the long observation period. Intensive long-term collaboration together with the case company representatives and researchers increased the in-depth understanding of how the innovation process evolved in the company, and what impacts and experiences were gained, as well as provided multiple sources for rich data collection and triangulation.

Data Collection. For empirical data gathering, several sources and techniques were used to collect evidence for the case study as presented in Table 3 (c.f., Fig. 1). Frequent meetings with the company representatives (Head of Quality and the Innovation Management (IM) consultant) were conducted to verify the researchers' interpretations and emerging conclusions. The representatives continuously followed the company internal data, including the KPI measurements.

The role of the IM consultant was central in the development of the company innovation process as a participative insider expert. Thus, s(he) was a key informant both as a data source and for the validation of the research conclusions.

Data Analysis. The principal method of the empirical data analysis was the constant comparison method [24]. The collected, mostly qualitative data was explored and grouped with respect to our research themes (RQ1–3) to form a set of statements.

They were then examined to discover the underlying themes and potential explanations of the underlying phenomenon to build more theoretical propositions. The complementary data in Table 3 related to continuous planning practices in business processes and continuous engineering in R&D processes. It helped framing and comprehending the innovation process in the case company business and R&D operations context.

Table 3. Empirical data collection.

ACTS (Fig. 1)	**Themes, topics**	**Subjects**	**Methods**	**Data types – contents**	**Use in analysis**
Related inquiries	Continuous planning	various managerial levels	semi-structured interviews	qualitative – operative planning practices across organization	complementary
Interview 1	CI process: current status and targets	Head of Quality, IM consultant	semi-structured interview	current state challenges, targets, plan and scope	primary
Interview 2	CI process: status and targets	Head of Quality, IM consultant	semi-structured interview	targets, goals and current problems	primary
Interview 3 Workshop	CI process improvement status, first use experiences	Lead of Tools Dev, Head of Quality, IM consultant	current state analysis – workshop	current state process map, improvement points; experiences of improvements, further improvement needs	primary
Interview 4	CI: progress status and next goals	IM consultant	semi-structured interview, numerical data show	conducted improvements and experiences, identification of new improvement actions	primary
Interview 5	CD, information and process transparency	Tech team Lead, Tech specialists (2), QM	brainstorming	conducted improvement activities and experiences, next steps	complementary
Interview 6	CI acceleration methods, usage and experiences	Head of Quality, IM consultant	semi-structured interview	qualitative data – used methods, experiences; next steps	primary
Interview 7	Enrichment and validation	Head of Quality, IM consultant	semi-structured interviews	conducted activities and experiences; enhanced, verified research conclusions	primary

4 Results

4.1 Measurements

During the longitudinal case study observation period the company Ideas Tool recorded the quantitative KPI measures defined in Table 2. Fig. 3 shows the trends of the

harvested ideas (KPI1) and the validated business ideas (KPI3). The trend charts are mapped here to the timeline of the company innovation process improvement activities and the research events (c.f., Fig. 1). Table 4 presents numerically how the different KPI values changed over the observation period. Note Table 1 for the target state.

Table 4. Case company KPI evolutions during the observation period.

KPI (Table 2)	**Initially**	**Finally** (end of observations, Q4/2016)
KPI1 (# of harvested ideas)	Could not be measured in the beginning because there was no mechanism to do that.	By the end of the observation period, the number was 10-20 ideas per month.
KPI2 (# of people participating)	Less than 5% of the company employees participated in the innovation process.	The number had exceeded 10% of the total number of employees
KPI3 (# of ideas in business validation)	less than 26% of the total number of ideas	That value was 35%.
KPI4 (cycle time of an idea)	There was no mechanism to measure it in the beginning.	The best measurements were determined to be less than 8 weeks from idea registration to business decision.
KPI5 (frequency of potential business idea demonstration)	one month	one week

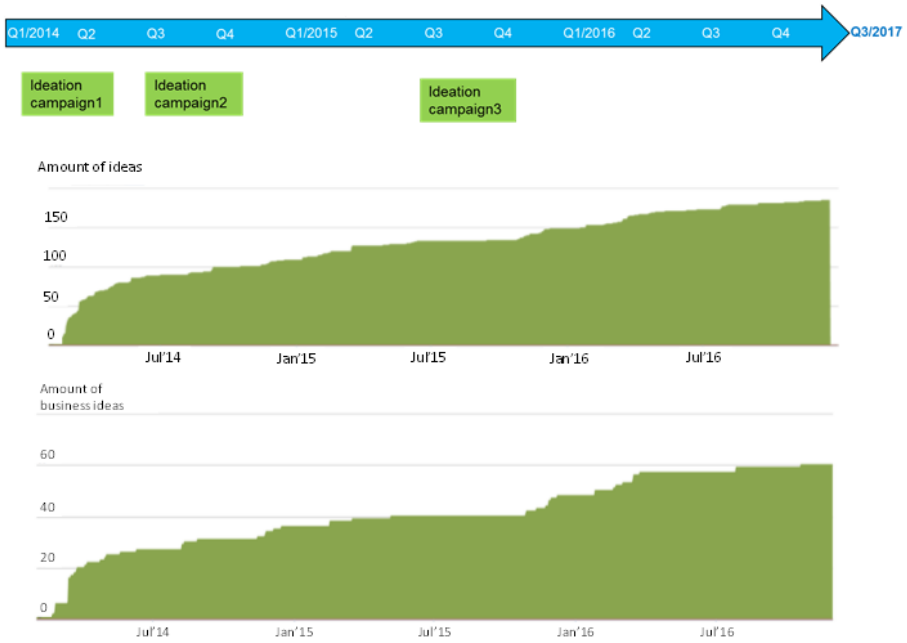


Fig. 3. Cumulative trends of the submitted ideas and the business ideas in validation during the observation period.

4.2 Observations and Findings

In the qualitative data analysis the empirical observations and discoveries were formulated as statements grounded on the data and grouped according to the research questions RQ1-RQ3. Altogether we noted 52 such items. Table 5 presents the ones which we evaluated to be the most essential ones.

Table 5. Key empirical observations.

LABEL	Statements
<S1>	By keeping the threshold to submit ideas low and by not isolating ideation process away from the operative context triggers employees more actively participate in the process.
<S2>	Ubiquitous ideation practice makes employees more confident to submit ideas because they trust that sufficient experts of the relevant business and technology domain will review their ideas.
<S3>	Innovation work is supported by a systematic but lightweight screening process, enabling fast and regular feedback between management and developers.
<S4>	Light demo planning is iterative process and visible in the Ideas Tool, which supports continuous learning and feedback. This means that many ideas start to reach the maturity level for business decisions.
<S5>	The process pushing the fast incremental growth of ideas with frequent screenings and collection of versatile feedback and early feedback ensures that ideas will reach the maturity level needed for business decisions in proper time.
<S6>	The use of a frequent and systematic screening process, which was a practice in the old stage-gate model, ensures that idea growth is systematic and validated, but at the same time is flexible enough to handle rapid experimentation as well.
<S7>	Synchronization between business planning, budgeting and operative work enables the flow in the innovation process.
<S8>	It is important to enable opportunities for creative people, share relevant information (e.g., strategic needs, customer and technology demands, ideas, feedback), organize events and actions so that the innovation process stays continuous and focused, but give flexibility for ideas to grow and connect together.
<S9>	The process and the flow how an idea grows to an innovation, or ends up being canceled or put on hold, is all the time visible in the Ideas Tool, making sure that all the steps and the overall progress of the idea is known by all stakeholders.
<S10>	Transparent idea feedback is a way for any stakeholder to see what is discussed and decided regarding an idea. This also enables extremely busy specialists to participate in the idea growth.
<S11>	The main triggers for more efficient idea focusing is that the Ideas Tool is integrated to existing tool chains in the company ensuring that ideas are connected to dependent items and business cases from the beginning.

The statement items were then mapped to the continuous innovation process phases of idea harvesting, focusing, and validation illustrated in Fig. 2. In the following, Table 6 and Table 7 present the mappings of the items in Table 5. In the data analysis we compiled a full mapping of all the 52 items of which these tables are thus subsets.

In these tables each row represents individual items shown in Table 5. The column shadings indicate the ideation life-cycle spans that the items concern primarily.

In Table 6 the rows are clustered according to the performance targets defined in Table 1. In addition they are partially ordered following the flow of ideas from idea generation to business decision.

Table 6. Mapping of factors affecting continuous innovation performance (RQ1).

IDEA HARVESTING	IDEA FOCUSING	IDEA VALIDATION	Business Incubation, Project
<S1>			
<S2>			
	<S3>		
	<S4>		
	<S5>		
<S6>			
<S7>			
<S8>			

Table 7 categorizes what particular visibility and information sharing impacted the continuous innovation performance (positively). Like in Table 6, the rows are partially ordered following the flow of ideas from idea generation to business decision. Notably, contrasting, we were also interested in finding out whether the lack of certain transparency has restrained innovation performance. Our empirical evidence suggests that the open sharing of idea information was perceived to improve idea development and progress compared to the former, limited-access IPR-focused innovation process. In addition there was some evidence indicating that initially the lack of linking ideas to product program roadmaps made it complicated to achieve a comprehensive overview.

Table 7. Mapping of impact of transparency (RQ2).

IDEA HARVESTING	IDEA FOCUSING	IDEA VALIDATION	Business Incubation, Project
<S9>			
	<S10>		
	<S11>		

Considering the role of IT tools (RQ3), in our case company the Ideas Tool was the main innovation (idea) management and information sharing IT tool (see Sect. 3.1). In Table 6 and Table 7 it is explicitly noted in <S9>, <S4> and <S11>.

5 Analysis and Discussion

5.1 Principal Empirical Conclusions

In the following Table 8 we separate out our key empirical observations presented in Sect. 4.2. It suggests a mapping to the associated components of innovation capability leaning on the conceptual framework introduced in Sect. 2.2 (exploitation of the com-

pany innovation potential, activities of its innovation process, and the results of the activities) proposed in [19]. The capital X letters indicate what we discern to be the major associations.

Table 8. Innovation capability associations from the key empirical observations and findings.

Statements (see Table 5)	**Innovation Capability Elements**					
	People, Interactions	Data, Information, Knowledge	Process	Tools	Products, Business	Organization, Culture
<S8>	X	x	x		x	
<S1>	X		x			x
<S2>	X		x	x	x	x
<S9>	X	x	x	x		
<S10>	X	x	x			x
<S3>			X			x
<S4>		x	X	x	x	x
<S5>			X		x	
<S6>			X		x	
<S7>			X		x	
<S11>		x		x	X	x

5.2 Related Studies

Table 9 compares the main results, findings and suggestions of the related research reviewed in Sect. 2 against our key results by reflecting the statements presented in Table 5. Only the central points are highlighted here.

Table 9. Comparing selected related research and this case.

Publications	**Related Focal Points**	***Our Research***
Continuous Innovation Performance (RQ1)		
[17]	• dualistic idea management to encourage and handle both continuous and discontinuous ideas	<S6>
[5]	• ideas coming from different sources across and beyond the organization	<S1>
[19]	• realizing linkages and potential cause–effect relationships of innovation and business performance	<S7>
[16]	• managing and developing continuous innovation utilizing varieties of performance measurements	<S5>
[18]	• self-reliant individuals as innovators	<S1>
[13]	• determinants of innovation (e.g., organization resources, knowledge / information, tool support) influencing the innovation capability	<S8>

Transparency (RQ2)		
[5]	• idea owners able to follow up the status and progress of their ideas, ideas handled in a transparent way	<S9>
[13]	• providing transparency to the organization's innovation related internal workings	<S9>
[20]	• transparent idea screening criteria	<S3>
[19]	• Potential measures in different business performance perspectives: flexibility of decision-making with effective information flows, effectiveness of problem-solving with history information	<S4>
[18]	• Individual employees have open possibilities to access and acquire relevant information and competence to generate ideas.	<S8>
Innovation Management and Information / Knowledge Management IT Tools (RQ3)		
[17]	• IT tools enabling systematic and efficient handling of ideas	<S9>
[20]	• IT platform contributions to the innovation process by involving different stakeholders for idea generation and decision-making (cross-functional, cross-department innovation)	<S10>
[5]	• ubiquitous idea management systems accessible anywhere at any time and through different media channels, allowing distributed staff to participate in the ideation	<S2>
[18]	• data utilization with accessible and integrated IT systems	<S11>

By and large our empirical case study results tend to correspond with the related research. However, our contribution is to frame the individual items with respect to the whole innovation process (from ideation to R&D and business) and the organizational continuous innovation capability as portrayed by our research questions (RQ1-3).

Our research contributes to the knowledge gaps and research needs identified in the prior works (Sect. 2). With this industrial in-depth case study we have portrayed how a continuously innovating company looks like and in what ways the company has been developing its innovativeness. We have compiled a set of statements and propositions for explaining mechanisms affecting innovation performance. Furthermore, we have examined how certain performance metrics (KPIs) manifest themselves in practical innovation activities. We have already analyzed them in our previous works [12].

5.3 Implications

Managerial Implications. In general, all the items in Table 6, Table 7 and Table 8 have some managerial impacts and concerns. Consequently, companies should contemplate them from their points of view. However, in our view – informed by the case company insights – particular managerial emphasis should be put on the people-related and organization culture items like suggested in Table 10.

Table 10. Primary managerial implications stemming from the empirical observations and findings.

Statements	Implications
(not shown in Table 5)	Trigger increasing the amount of harvested ideas is by *collecting ideas systematically*, *sharing them among stakeholders* and *learning from them* throughout the life-cycle.

<S1>	Encourage employees to participate more actively in the innovation process by keeping *threshold to submit ideas low* and by incorporating the *ideation process into the operative contexts*.
<S2>	Raise employee confidence in regard to submitting ideas by using *ubiquitous ideation practice*.
(not shown in Table 5)	Create pull toward the overall innovation process by continuous *transparency of harvested ideas*, continuous *communication of innovation targets and strategic business needs*, and through constructive *feedback by managers and experts*.
(not shown in Table 5)	Foster and steer people to contribute with relevant business ideas by *transparent and integrated idea-related information*.
<S10>	Engage relevant stakeholders and critical specialists to participate in the idea development by *transparent feedback*.

Efficient information systems (IT tools) can be developed and utilized to support to implement the suggestions in Table 10 in practice. That is particularly central in order to achieve the benefits of transparency across the entire organization and in real time. Moreover, the information systems facilitate building and cultivating versatile and integrated organizational memory over time. They furthermore support engaging intra-organizational networking of people and knowledge.

With respect to transparency, it is important to consider both the ideas-related information transparency (e.g., business cases) and the innovation process transparency (e.g., screening). Considering the former type of transparency, not only the visible information in information systems but also tacit knowledge and informal (even face-to-face) communications are relevant. One of our findings was for instance that some ideas submitted to the Ideas Tool were seen to be already in the first stage thought-out and mature suggesting that the ideators may have discussed intensively with their colleagues and interacted with the business owners and domain experts already before submitting their ideas formally.

In the innovation process transparent idea handling may increase awareness and accountability between management and employees. In our case company in the ideation campaigns (c.f., Fig. 3) business owners and technology experts communicated needs and targets in pitches. It was possible to submit ideas face-to-face and to get immediate feedback from the business owners. The frequent screening and idea reviews were perceived to be (interview quote) “the engine of the innovation process”. Every new idea was assigned to relevant specialists to foster discussion for the idea to grow further and to find relevant owners.

In all, it is important to realize that continuously high innovation performance requires that the entire value network of idea generation, idea development, R&D, and commercialization works successfully. Inefficiencies or obstacles in any of the above elements may lower the total innovation system performance. The grand challenge for each organization is to realize their full innovation potential and to be able to fully utilize it.

Theoretical Implications. Exploratory case studies are typically conducted as initial investigations to derive new hypotheses and build theories. In the early stages of our research work we have asked exploratory research questions in order to understand

the phenomena of and around continuous innovation (RQ1) in practical industrial organization context. In doing so we have tentatively attempted to identify and understand the key concepts, constructs, and their relations. Transparency (RQ2) and IT tool support (RQ3) have been our particular key elements of interests.

The statements in Table 5 can be elaborated and formulated as generalized propositions. The following exemplifies that (see <S1> in Table 5):

- **Proposition 1a**: when *Threshold to submit ideas low and by not isolating ideation process away from the operative context => Employees participate more actively in the process*
- **Proposition 1b**: when *Not isolating ideation process away from the operative context => Employees participate more actively in the process*
- **Proposition 1c**: when *Employees participate more actively in the process* => Improved innovation performance

These propositions can be tested as hypotheses in future research (confirmatory case studies). Naturally they must be operationalized with testable measures, such as our KPIs in Table 2. Such tests could also explain our observed trends in Fig. 3.

5.4 Limitations and Threats to Validity

This study is based on a single-case setting and was conducted within one company context. The case selection stems from our long-term research collaboration relationships with the company (convenience sampling). We acknowledge that this may have caused some sampling bias. We also refrain from evaluating how representative our case company is within the industry sector. Multiple-case analysis could provide stronger support for theory development [25].

During the data analysis we did not have direct access to the company's confidential information of the individual idea items. Statistical analysis was thus not possible. We were also not able to detail either the types of different ideas (i.e., product, process, organizational, business) or the radicalness of the innovations. The plan was also to measure and analyze concrete examples of radical innovations in the future. However, that was not realized due to the confidentiality of the actual company business needs and the performance information. Overall, the innovation process improvement was aiming to increase the share of business innovations in the long term. Based on the results from first two years (2015-2016, c.f., Fig. 3) the new innovation approach could be seen to be effective as the share of business innovations has been constantly raising. However, it is for further study to confirm such cause–effect relationships (propositions in Sect. 5.3).

We recognize certain threats to validity [23]. Considering the construct validity, one particular threat may be that we did not present any specific definition of 'transparency' (RQ2). Internal validity may be a concern when causal relations are investigated. In this study we have extracted propositions with some suggestions for possible cause–effect relations. However, we do not confirm them decisively here. With respect to the external validity the intention of the presented propositions is to enable analytical generalization for extending to cases in other companies with similar char-

acteristics. Finally, the data collection interviews (see Table 3) were mostly conducted by the same one researcher. They were semi-structured, some of them with partially informal interview protocols and only manual note-taking. Those may be concerns for the reliability.

6 Conclusions

In this empirical study we have investigated how one established industrial high-technology B2B company has fostered continuous innovation with people-engaging, transparent IT tool-supported information sharing. A longitudinal, single case study was performed in the case company which was conducting significant changes in innovation practices at the time.

Grounded on the collected empirical data in the single-case company context we compiled a set of statements and propositions of the continuous innovation process and its performance factors. By and large our results and findings align with the previous related research. However, we emphasize the subtle, agile and lean organizational factors of orienting and encouraging employees for creative but fitting idea generation, and engaging key experts and business stakeholders to idea development at right times in a transparent manner. These work in conjunction to transparent innovation process practices (e.g., screening) and information sharing IT tools. Potential performance measurements (KPIs) for continuous innovation process improvement have been evaluated in this case.

We suggest further research for comparable analysis and business performance measures, in particular with respect to knowledge creation and utilization to harness the full innovation capability and its business performance effects. Our future research plans are to expand the case with additional industrial cases of innovation capability development. Cross-case analysis would make it possible to compare and contrast our statements (Table 5) in more general and test the propositions (Sect. 5.3).

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