



**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
Main Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2016

Designing an idea screening framework for employee-driven innovation

Ciriello, Raffaele Fabio; Richter, Alexander; Schwabe, Gerhard

Abstract: As ever more companies encourage their employees to realize innovations, a surplus of ideas that exceeds the available resources to implement them has become reality in many organizations. With this paper, we follow recent calls for designing IT-supported, comprehensive, multi-attributive idea screening throughout the whole innovation cycle. Our Idea Screening Framework is grounded in literature and empirical data we collected from a two-year field study in a multinational European banking software provider. We identify a set of dimensions for screening ideas and show with a prototype how the framework can support innovation practices by facilitating the evaluation, selection, and tracking of ideas for managers and innovators.

DOI: <https://doi.org/10.1109/HICSS.2016.529>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-122873>

Conference or Workshop Item

Published Version

Originally published at:

Ciriello, Raffaele Fabio; Richter, Alexander; Schwabe, Gerhard (2016). Designing an idea screening framework for employee-driven innovation. In: 49th Hawaii International Conference on System Sciences (HICSS 2016), Hawaii, USA, 5 January 2016 - 9 January 2016, 4262-4271.

DOI: <https://doi.org/10.1109/HICSS.2016.529>

Designing an Idea Screening Framework for Employee-driven Innovation

Raffaele Fabio Ciriello
University of Zurich
ciriello@ifi.uzh.ch

Alexander Richter
University of Zurich
arichter@ifi.uzh.ch

Gerhard Schwabe
University of Zurich
schwabe@ifi.uzh.ch

Abstract

As ever more companies encourage their employees to realize innovations, a surplus of ideas that exceeds the available resources to implement them has become reality in many organizations. With this paper, we follow recent calls for designing IT-supported, comprehensive, multi-attributive idea screening throughout the whole innovation cycle. Our Idea Screening Framework is grounded in literature and empirical data we collected from a two-year field study in a multinational European banking software provider. We identify a set of dimensions for screening ideas and show with a prototype how the framework can support innovation practices by facilitating the evaluation, selection, and tracking of ideas for managers and innovators.

1. Introduction

Fostering innovation has become a fundamental and necessary practice for companies to thrive and survive in today's globalized and competitive markets [1], [2]. Against this backdrop, employee-driven innovation emerges as increasingly important phenomenon [3]. This poses new challenges for innovation management, as the number of potentially valuable ideas usually exceeds an organization's capacity to put them in practice [4]. A recent global study among 1.600 executives found that selecting the right ideas was among the top three obstacles when investing in innovation [5]. Moreover, idea screening is a cognitively challenging task imbued with uncertainty, and a recent study among 330 managers found that organizations using information systems (IS) are more effective in screening collected ideas [6].

Alongside with the screening process itself, studies have shown that employee-driven innovation also means that the innovators need support from experienced colleagues that challenge and enrich their ideas [3], [7]–[9]. For such facilitators it is important to maintain an overview over existing ideas and initiatives within the company. As such, employee-driven innovation crucially depends on appropriate screening (i.e. evaluation, selection, and tracking) of ideas that innovators and facilitators carry out. Hence,

the need for comprehensive, multi-attributive idea screening support throughout the whole innovation cycle has recently been brought forward [6], [10], [11]. For this reason, we raise the guiding research question: *How can an information system facilitate the evaluation, selection, and tracking of ideas in employee-driven innovation?*

Our contribution is threefold. Firstly, we elicit and illustrate the requirements for supporting idea screening and make a case of the employee-driven innovation practices in a software firm. Secondly, we identify a set of dimensions for screening ideas, namely purpose, value proposition, risk of adopting, risk of rejecting, scope, type, stage, communication strategy, resources, and participant roles. Through these empirically and theoretically grounded dimensions, we illustrate the multifaceted nature of ideas. Thirdly, we create an IT artifact and thus provide a proof of concept by showing how the Idea Screening Framework can be deployed in practice.

The remainder of this paper is structured as follows. We start by summarizing extant literature on employee-driven innovation and idea screening. The research method section then offers detailed insights into the applied method and illustrates how both literature and insights from our empirical study informed the design of the Idea Screening Framework. In the following sections, we describe in detail (1) what problem the Idea Screening Framework addresses, (2) what our proposed solution design looks like, and (3) how we implemented the Idea Screening Framework in an organization. We conclude with summarizing what lessons can be learned from the design and pointing to future research.

2. Related Work

Studies that informed our design are rooted in the emerging fields of digital, open, and employee-driven innovation as well as in the field of idea screening.

2.1. Employee-driven Innovation

Self-organizing networks of employees are a crucial driver for the development of complex and innovative digital technologies [1]. In an increasingly

networked corporate environment, a differentiation strategy based on product, process, or business model innovation can be a key source of competitive advantage [1], [2]. In this context, the open innovation paradigm suggests to purposefully use both inflows and outflows of knowledge to accelerate internal innovation and expand the market for external innovation [12]. Thus, open innovation leads companies to replace centralized R&D departments with more network-based work structures [3, pp. 8–14]. Since traditional R&D structures only enable selected experienced employees to work on ideas with a long-term impact, ever more companies facilitate collecting ideas from all sides [13]. Today's leading innovative companies encourage employees to act entrepreneurial within the confines of the organization, relying on its technical, financial, and professional resources [3]. Shrinking innovation cycles and new digital technologies make innovation more networked and employee-driven [14], [15] and increase the need of understanding the larger societal and economic impacts of this new paradigm of innovation [3], [9]. Employee-driven innovation is a new form of direct participation in which the employee takes the initiative to generate, develop, and implement ideas for innovative products [9], [16], [17]. Within every employee lies an innovative potential, which organizations need to foster and facilitate [18], [19]. Therefore, idea screening is an integral part of employee-driven innovation that requires according facilitation support.

2.2 Idea Screening

Employee-driven innovation offers new possibilities, but also poses new challenges to traditional ways of innovating in firms. This requires a revisit of established approaches for screening ideas, as this section illustrates.

Classical approaches for realizing value from IT investments, such as IT portfolio management [20] and benefits management [21], are helpful for integrating new digital technologies into the corporate strategy in a way that envisaged benefits are achieved (outside-in). However, screening large amounts of ideas from different sources in a short time requires a radical rethink of received strategic frameworks to manage IT projects [22]. To cite a prominent case, the British Petroleum (BP) company placed a public call for ideas to contain the infamous oil spill resulting from the Deepwater Horizon disaster in 2010. During this period BP received more than 35,000 ideas. However, lacking a way to quickly and accurately screen these ideas from diverse sources, frustration grew as BP seemed unable to select and implement solutions in time [4].

More recently, innovation platforms gain momentum as a promising means to fund and realize ideas from a crowd of internet users [23]. However, it remains a challenge to integrate these approaches with innovation initiatives in a corporate context [6], [10]. For instance, a recent study among 313 participants of an innovation community found that popular simple idea screening mechanisms based on thumbs up/down or 5-star rating are invalid and outperformed by more fine-granular, multi-attributive idea screening mechanisms [10]. In line with this, a study argues that idea screening mechanisms purely based on numeric scores tend to be too restrictive to reflect the value of human intuition [4]. However, practitioners tend to prefer simple scales based on benefit and risk, often neglecting more complex approaches [24]. Although recent studies acknowledge the potential of IT to better capture the complexity of idea screening, we know little yet about effective designs in practice [6].

Hence, we identify a research gap on how to provide comprehensive and multi-dimensional idea screening support for employee-driven innovation. Our goal with this paper is to (1) elicit the requirements of idea screening in the context of employee-driven innovation and (2) propose an Idea Screening Framework that fits the according work practices of various stakeholders.

3. Research Method

Since our goal is to extend human and organizational innovation capabilities by creating a new artifact, this paper follows the design science research (DSR) in information systems (IS) paradigm [25] and builds on the well-established DSR framework by Peffers et al. [26]. Hence, it is structured along six generic DSR activities: 1) *problem identification*, 2) *objectives of a solution*, 3) *design & development*, 4) *demonstration*, 5) *evaluation*, 6) *communication*. Activities 1-5 are described in respective sections, and activity 6 is the paper's aim.

Initially, we identified the problem relevance and motivation for an Idea Screening Framework from a two-year ethnographically informed empirical study [27] of innovation practices at a multinational European banking software provider. Relying on the identified problem scenarios and the above described literature, we developed an initial prototype using the scenario-based development method [28]. Next, we discussed the early prototype extensively in the research team and obtained feedback from key informants from practice, who viewed the addressed problem from various perspectives [29]. From these sessions we obtained helpful feedback, e.g. about different goals of managers and innovators with the system and were also able to develop and evaluate a

working prototype. The following sections illustrate these steps in detail.

3.1 Case Presentation

Since the above described previous research suggests that idea screening is especially relevant in innovation processes that are employee-driven [3], involve the confluence of ideas from various sources [12], and deal with high degrees of complexity [7], we selected the case based on three criteria: 1) high activity of employee-driven innovation 2) high degree of collaboration and 3) high innovation complexity. This led us to a European software company.

Founded in the early 1990ies by a group of software engineers, the company rapidly grew to an international market leader in banking software. Until 2008's financial crisis increased the pressure to innovate and diversify its solution portfolio, the strategic focus of BITS was the development, distribution, and operation of its proprietary core banking system. The executive board became increasingly concerned that the product lifecycle of that system might have peaked, and initiated substantial investments in establishing an internal innovation management framework. In the following years, the strategic focus of BITS became the development of new products, services, and business models in collaboration with customers, external partners, and universities. In the last two years, the company grew from around 600 to more than 1400 employees in two development centers and seven subsidiaries worldwide.

3.2 Case Data Collection

In the first data collection phase (02/2013 – 10/2013), the study focused on the way employees communicate ideas across intersecting social worlds. The first author spent between 2-4 days a week onsite at the BITS headquarter and had access to an in-house workstation and intranet platforms. From there, the author conducted 32 semi-structured interviews to get an in-depth understanding of the focal phenomenon from a participant's perspective [30]. Executives provided an initial set of interview partners and we proceeded with snowball sampling, through the network of personal contacts [31, p. 200]. Questions addressed the participants' innovation practices when collaboratively developing ideas, whereat participants were required to use authentic examples of their own experience. In doing so, we were able to document in detail the information requirements of various stakeholders throughout the innovation process. The phase ended with writing an interim study report with a status quo analysis, which we discussed with BITS to inform about our findings and frame the next phase.

In the second data collection phase (01/2014 – 12/2014), the study focused on how BITS employees collaborate across geographically distributed locations. The first author continued to spend between 1-2 days a week onsite at the BITS headquarter, and additionally spent between a week in a row onsite at a remote subsidiaries of BITS, during which he interviewed additional 30 experts. Questions addressed the way employees organize and share information about their innovative ideas. We thoroughly analyzed online networking platforms regarding their actual and potential usage for innovation and elaborated a set of key use cases. Using multiple sources of evidence [29] and triangulating between 1) the primary data from the interviews, and 2) the collected secondary data we extracted from these platforms, we were able to draw a more detailed picture of the actual innovation practices. The second phase ended with a report of an early concept of the Idea Screening Framework that we discussed with BITS representatives to identify concrete actions to take in the next phase.

In the third and ongoing data collection phase (from 01/2015), we developed an IT artifact as proof-of-concept and deployed it in BITS' intranet. The IT artifact instantiates the previously defined Idea Screening Framework, and we conducted several workshops with BITS employees to evaluate the artifact's usefulness.

3.3 Case Data Analysis

We carried out the data analysis collaboratively relying mostly on interview transcripts, collected documentary material, and field reports. We met in a group of four researchers in weekly focus groups [32] to maintain a critical distance with the case company [33]. The interviews were recorded, transcribed, and processed using MAXQDA, where two researchers developed a codebook to facilitate joint analysis and increase confidence in the findings [34]. Two additional researchers carried out coding checks to ensure intercoder reliability and develop a shared conception of reflection [35], through which we identified problem scenarios and solution objectives.

3.4 Structured Literature Analysis

Parallel to the case data collection cycles, we conducted a structured literature analysis in which we followed the well-established framework by Vom Brocke et al. [36]. Hence, we conducted the five generic steps: 1) *definition of review scope* 2) *conceptualization of topic* 3) *literature scope* 4) *literature analysis and synthesis* 5) *research agenda*. Steps 1-3 followed from the field study in which we identified research topics and the scope, namely idea screening in employee-driven innovation. In step 4 we

searched on Google Scholar and AIS electronic library for the keywords “digital-, employee-driven, and open innovation, innovation management, -practices, and -roles, idea screening, -evaluation, -selection, -assessment, and -tracking, balanced scorecard”, selected 73 sources from reading the titles and abstracts, and synthesized the selected sources into an early version of the here presented Idea Screening Framework. We then framed the research agenda (step 5) by moving back and forth between data and literature, interrogating field material to check whether the data supported emerging claims, and whether literature helped us making sense of the empirics [37].

4. Problem Identification and Solution Objective

In this section, we illustrate in detail the problem understanding we obtained from the empirical study and illustrate the information requirements for the various stakeholders of the innovation process. The problem scenarios are stylized cases of observed recurring problems at the case company [28].

Problem Scenario 1 (Innovator wants to realize an idea): “Malcolm, a 25 year old recent university graduate and junior software engineer at BITS, recently had an idea for a mobile banking application for smart watches. He quickly sketches a few screens and discusses them with colleagues during a coffee break. Malcolm’s colleagues are excited about the idea, but he is still unsure about its feasibility, since BITS does not have any experience with smart watch applications yet. Also, Malcolm does not have a well-established network in the company yet, so he asks his line manager for advice. The line manager is currently quite busy and tells Malcolm to ask Denis, an experienced business analyst, who has promoted a lot of ideas in the past. A bit doubtful, Malcolm reveals the idea to Denis, who generally likes it, but emphasizes the importance of elaborating a business plan, to see how the company can make money with the idea. Malcolm has never created a business plan, but is motivated to invest two weeks of his spare time and a lot of help from his peers to write one. Afterwards, Denis sends the business plan to Corinne, an innovation manager at BITS. Corinne knows by chance that another team already develops a prototype for such an application, which is very similar to Malcolm’s idea. Malcolm is very frustrated to have spent that much effort in vain.”

The key issues with this problem scenario are: Innovators do not fully understand the decision structures behind the innovation process of the company and lack an overview over existing ideas [7]. They need to invest substantial time in building a

social coalition for their idea, which is difficult because different stakeholders have different information requirements, and they often lack the social capital to persuade advocates and sponsors [3]. Innovators further need guidance and orientation to ensure completeness and consistency of relevant criteria, and to ensure that all relevant stakeholders are involved [8].

Problem Scenario 2 (The Innovation Board selects ideas for funding): “Corinne organizes a meeting with the innovation board, a committee of experienced employees, in order to decide which ideas should receive funding. She also invites the employees to present their business plans. Some presentations are very technical, and the innovation board has a hard time fully understanding the idea and assessing the benefits and risks. This makes the evaluation very demanding. Some of the ideas are presented with the help of an elaborated prototype. In these cases the ideas are more comprehensible, but deciding to not fund these ideas is even harder for Corinne, because she knows that already a lot of work was invested in the idea. Many of the presented ideas look promising to her, but she knows that they can only provide funding to few of them because most of them do not fit into the strategy of the company. Moreover, the resources they can allocate are limited, because this year’s strategy is to focus on implementing customer requirements. They have to rely on intuition to evaluate the ideas, as fully evaluating all ideas in these different representations would be too demanding and time consuming.”

The key issues with this problem scenario are: There is often an abundance of ideas existing in a company [12], [38], and therefore idea screening is a time consuming and cognitively demanding task, because it is very hard to assess the potential value of an individual idea [39], given that ideas are often hard to compare with each other [3]. Moreover, companies are often held captive by customer requirements which consumes innovation resources [40], because most funding decisions are based on financial aspects. One drawback of screening models purely based on numeric scores is that they tend to be too rigid and neglect human reflection and experience [10].

Problem Scenario 3 (Innovation Manager wants to track ideas): “Corinne, a 38 year old now innovation manager and former product manager at BITS, has her monthly status meeting with the CEO. The CEO just came back from an IS conference and was intrigued by a talk about crypto currencies. She is convinced that crypto currencies will soon become a disruptive innovation in the banking industry, so she asks Corinne whether there already exist any related ideas in BITS. Corinne must acknowledge that she does not know. She has only recently taken over this position after the

former innovation manager left the company. There is no idea repository and Corinne must now ask all responsible innovators for current status of all innovation projects she inherited. The innovators themselves are not satisfied with having to start explaining their ideas anew and often give Corinne snippy responses. Both the CEO and Corinne are frustrated that even the innovation management does not seem to know about all ideas within the company.”

The key issues with this problem scenario are: It is very difficult to have an aggregated view over existing ideas [3] in order to detect strengths and weaknesses in the innovation process and compare the innovativeness of the company with other organizations [3]. After all, trends in technology are difficult to anticipate, as any innovation involves some degree of uncertainty [41].

From these problem statements, we identify that the *solution objective* of an Idea Screening Framework is to facilitate the evaluation, selection, and tracking of ideas in an organization. The Idea Screening Framework should on the one hand give innovators guidance through the innovation process by evaluating, selecting, and tracking ideas. Through a central idea repository, innovators should be able to evaluate ideas by submitting them in a semi-structured manner, focus on relevant criteria, find relevant experts, and obtain community feedback. Through this idea repository, innovators should also be able to select relevant ideas from a large pool and, thereby, get an overview and orientation of the existing innovation process. Entries in the idea repository should enable the innovator to track the status of his/her idea.

On the other hand, the Idea Screening Framework should also allow managers to evaluate, select, and track ideas in order to make informed decisions of innovation projects within the organization. Through an aggregated overview of the innovation process, managers should be able to detect weaknesses and strengths by evaluating ideas in different stages, and make micro and macro level analyses of ideas. Through a semi-structured set of criteria, managers should be able to compare ideas against each other and select the most promising ones for further funding. Again, entries in the idea repository should enable managers to track the status of ideas.

To conclude, the Idea Screening Framework should provide enough structure to adequately illustrate decision-relevant information for managers at the right level of detail and abstraction, but at the same time provide innovators with enough flexibility to allow for sufficient interpretive openness and ambiguity that matches creative ideas. If the framework was too rigid it would prevent complex ideas to emerge and only serve few managers for decision support [3], but innovators would not feed the system with the

necessary data. However, if the framework was too loose, the process would become arbitrarily complex, ideas could not be compared with each other, and managers would not take the system seriously. Hence the Idea Screening Framework should fulfill the requirements of a boundary object and be both flexible and robust to develop a common understanding and maintain coherence across intersecting social worlds [42].

5. Artifact Design and Development

So far, we motivated the need for an Idea Screening Framework by illustrating the problem, along with its significance, and envisaging how a better solution could look like. In this section, we describe in detail the concepts behind the Idea Screening Framework and the functionality of the IT artifact we implemented.

5.1 Dimensions

Our literature and empirical analysis yielded the following dimensions that are important for screening ideas: *Purpose, Value Proposition, Risk of Adopting, Risk of Rejecting, Scope, Type, Stage, Communication Strategy, Resources, and Participant Roles*. As shown in figure 1, these can be grouped into three categories.

Strategic	Purpose		Value Proposition	
	Risk of Adopting		Risk of Rejecting	
Tactical	Scope	Type	Stage	
	Communication Strategy			
Operational	Resources		Participant Roles	

Figure 1 – Dimensions of the Idea Screening Framework

Strategic dimensions are mostly important for executives to make a strategic decisions regarding of whether or not the idea should be pursued. For this effort, it is necessary to make assumptions about the benefit (which is incorporated in the Purpose and Value Proposition dimension) and risk of the idea. This is also important for potential collaborators, and customers to have a precise definition of the idea’s core selling point.

Tactical dimensions are mostly important for the idea owners and innovation managers to have an overview about the status and next steps of an idea or all managed ideas.

Operational dimensions are especially helpful for facilitators and the innovators themselves to carry the idea further step by step.

Purpose (why do we want to innovate?): Defining the purpose of an innovation helps to better understand the direction in which we are moving and the kind of benefits we can expect from moving into that direction. It facilitates the creation and recognition of links between the organizational strategy and the idea [43]. Ultimately, any IT innovation should create a clear business benefit.

The different reasons to innovate identified during our research can be encompassed by four different attributes. *Financial Growth & Profit* aims at increasing revenue or market share, winning new customers, selling more products or licenses, or entering new markets [40]. One interviewee stated “it would be more interesting to make money from this innovation. That would be my main goal.” *Competitive Advantage* aims at putting the organization ahead of competitors or preventing it from falling behind, for instance through achieving knowledge leadership, providing distinctive quality, or gaining the agility to profit from new opportunities [2]. One interviewee stated “if you have a complicated IT architecture, then your ability to move is like having lead weights on your feet”. *Efficiency Gain* aims at doing the existing business faster and with fewer resources than now, for instance through improving communication efficiency, reducing delivery time, and increasing the input/output production ratio. *Customer or employee satisfaction* has the purpose to increase the satisfaction provided to end users, whether they are inside or outside the organization [3]. Such innovations contribute to the creation of a compelling place to work and deal with sources of customer frustration.

Value Proposition (what value does the innovation deliver to the customer?): This dimension helps to identify the benefits that the innovation brings to the customer, and implicitly, the customer problems and needs that the innovation satisfies. This is important for the customer to determine whether or not to do business with the company. The attributes of this dimension are derived from the business model canvas [44].

Newness satisfies a new set of needs the customer did not perceive before. For instance, these days smart watches may fall into this category. *Performance* improves the perceived usefulness of the existing features of a product or service. *Customization* adapts a product or service to the specific needs of the customer, such as customized or co-created products. *Getting the job done* means that the value resides simply in helping customers to accomplish their goals by providing a platform so they can run their business according to their needs. *Design* offers an outstanding and appealing design and creates value through aesthetics and ease of use. *Brand/Status* provides value

by association with a specific brand with a certain social status. *Price* provides value through offering similar value than competitors, but at lower cost. *Cost Reduction* helps customers to reduce their cost, e.g. through self-service systems. *Risk reduction* reduces the risk of doing business, for instance through IT audits. *Accessibility* provides value by making the product accessible to customers who previously did not have access. *Convenience/Usability* provides value by making a product or service more convenient or easier to use, such as mobile banking apps.

Risks of Adopting (what risks do we face when doing the innovation?): This dimension refers to how the changes produced by the adoption of an innovation could negatively influence the organization and its environment. This is relevant for screening ideas because it helps to explore the scenarios that could result from adopting the innovation [45].

Monetary risks are financial risks of adopting the innovation. For instance, the actually needed resources may exceed the planned available resources due to poor project management or unforeseen factors such as changing requirements. *Non-monetary risks* cannot be measured in financial figures. For example, changes induced by the innovation may negatively impact some of the stakeholders, or the company may become dependent on a used technology and face lock-in effects.

Risks of Rejecting (what risks do we face when not doing the innovation?): This dimension refers to how the rejection of an innovation could affect the organization and its environment. This is relevant for screening ideas because it helps to explore the scenarios that could result from not innovating [45]. *Monetary risks* are financial risks of rejecting the innovation. For instance, the organization may miss potential profits (opportunity cost), or even have to pay fees and penalties when falling behind regulatory requirements. *Non-monetary risks* are risks of rejecting the innovation that cannot be measured in financial figures, such as falling behind a competitor or negative reputation that results from being an innovation laggard [45].

Scope (whom do we innovate for?): This dimension refers to the target group of the innovation endeavors, which can either be internal or external [1]. This dimension can provide awareness about the balance of the innovation efforts made by the organization internally and externally. External innovations would encompass all products, processes, and services developed for customers outside the organization; while internal innovations comprise the innovations developed to be used within the organization.

Type (what type of innovation do we do?):

Considering the type of innovation is important because different types of innovation require different managerial approaches [46]. Recognizing and selecting the correct approach is vital for the success of the idea. *Incremental innovation* describes smaller incremental improvements on existing products, processes, or business models. *Radical innovation* refers to the creation of breakthrough products, processes, or business models with novel and unique characteristics, which often leads to a complete replacement of the previous working model [47]. *Disruptive innovation* encompasses those innovations that transform a product or service in a way that the market does not expect, usually aiming at a new group of consumers. This may involve the downgrading of the product to make it more accessible to customers that would not have afforded it otherwise. For instance, Henry Ford created a disruptive innovation when he took the existing idea of luxurious handcrafted cars which were only accessible to the higher class, and created factory made cheap generic automobiles accessible to the middle class [48]. It is important to note that here, the type of innovation, reflects the inner view of the organization (i.e. is the innovation incremental, radical, or disruptive for the organization), not the market view.

Stage (what is the maturity level of the idea?):

Awareness about the maturity level of the ideas is important because it helps to identify what has already been done, what tasks are currently important, and what are the next steps. Identifying the stages of the innovation process is necessary for proper idea screening [4]. A five stage innovation process described by Desouza [3] serves as a base for this dimension. The process starts with the *Idea Generation & Mobilization* stage, where novel ideas are brainstormed from the daily business and informally set in motion, before they become discussable projects competing for funding in the *Advocating & Screening* stage. Here, idea owners advocate for the idea and build social coalitions, while managers are concerned with allocating resources to the most promising ideas. The funnel gradually narrows down in the *Experimentation* stage where innovators explore solution possibilities and constrain the possible solution stage by creating prototypes. Afterwards, the organization is concerned with turning the idea from concept to solution and developing a marketing plan in the *Commercialization* stage. Eventually, in the *Diffusion and Implementation* stage the company seeks to push the idea to the farthest corners of the market and show customers how to use the new product or service successfully.

Communication Strategy (how is the innovation introduced?):

This dimension covers the way the idea is implemented in the target organization. Not all ideas are introduced to the world in the same manner, and the way we introduce a new idea may have a significant impact on its subsequent success. This success depends on different factors such as resistance caused by attachment to existing tools, learning curves, or perceived low value provided to individual adopters in the beginning that only increases with the size of the adoption network [49]. Awareness of this Dimension can help to determine if and how an idea should be implemented at a given moment [50].

A *Big Bang* communication strategy introduces the innovation to the world all at once. A *Pilot* communication strategy introduced the idea at small scale in order to evaluate its performance before introducing it at full scale. The pilot is tested by a small group of users at first, and the innovation is released to the world after evaluating its success. A *Phase* communication strategy introduces the innovation to the world in phases, each phase taking place at a different time. Only the current phase of the idea is communicated to the world, but not the next steps.

Resources (what resources do we need to carry out the innovation?):

This dimension is important for screening ideas because feasibility analyses prior to taking ideas forward are crucial. Not considering technical, financial, market, and human resource aspects before starting to realize an idea could result in project failure or serious losses. A good understanding of the innovation capabilities of the organization is crucial to determine which ideas it can realize and which ones it simply cannot afford [48]. The attributes of this dimensions are extracted from [40]. *Human resources* refer to manpower required for carrying out the innovation, typically the number of project team members. *Equipment* refers to physical or digital instruments required for carrying out the innovation, such as IT equipment (hardware or software), building infrastructure, tools, or vehicles. *Financial resources* refer to the budget that is necessary to carry out the innovation, such as initial investment. *Intellectual resources* refer to know how that is necessary to carry out the innovation, such as technical, organizational, or business knowledge.

Participant Roles (who is involved in the innovation?):

Several studies focus on the identification and categorization of different roles relevant for innovation [51], [52]. Some authors use the roles of idea generator, idea champion, orchestrator, and devil's advocate [51], while others define the roles as product champion, gatekeeper, sponsor, business innovator, technical innovator, and

