GROUNDED INNOVATION – A RESEARCH APPROACH FOR THE FUZZY FRONT END OF INNOVATION MANAGEMENT[1]

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ABSTRACT

The paper presents a structured approach to fill the products and innovation roadmap of technology-oriented companies. Starting from requirements for managing early phases of innovation we develop an approach called grounded innovation. It adapts social research methodology known as Grounded Theory. The generative data-driven approach to discover new theories is transferred to the discovery of potential innovations. Available information sources are continuously being aggregated, selected and differentiated again if blind spots show up. Stakeholders are being involved in the proposition and initial rough specification of innovation candidates. Analyzing findings from various sources business opportunities, areas of interest, and finally search fields for innovation are synthesized in an iterative manner. The approach was tested and refined within a project of a large telecommunication company. In order to communicate the approach exemplary results are shown.

Keywords: Grounded Theory, Fuzzy Front End, Innovation Development, Search Field, Business Opportunities, New Product Development, Roadmap

INTRODUCTION

How to proceed from nothing to something? The identification of search fields for new business, but also the generation of new ideas in science, design, and engineering are usually considered ill-defined, or even random. We tend to assume that ideas fall like raindrops from the sky, and we just have to funnel or filter out the good ones to come up with the next big thing (Breuer, Hewing & Steinhoff 2009). Within the concept of open innovation the number of input channels to innovation development has been increased, but the in spite of increasing interest in the topic the fuzzy front end of innovation remains fuzzy. Even within large organizations early phases of innovation are not being addressed in a systematic way.

Like all creative endeavors research and early phases of innovation may not be completely formalized or controlled in a procedural manner. Still, successful projects share several characteristics respectively requirements that can and need to be managed. We assume that early phases of innovation profit from management, methodology and methods to be applied. In order to do so we developed, applied and describe one new approach called grounded innovation.

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Grounded Innovation adapts and applies qualitative social research methodology known as Grounded Theory (Glaser & Strauss 1967) to the identification and structuring of potentially valuable fields for innovation. Where Grounded Theory intends to discover new theory from empirical data, our grounded innovation approach intends to discover new search fields for innovation from heterogeneous data sources and findings. Starting from empirical findings like market data, competitive analysis, research reports, technology forecast and customer-centered insights on the one hand, and interviews with internal stakeholders and even external experts on the other hand empirical findings and potential opportunities for new business are being identified, aggregated, and qualified.
At first we discuss principles and guidelines for innovation management and related literature dealing with the fuzzy front end in new product development in order to sketch out basic requirements for our approach. We review the elementary notions of Grounded Theory and elaborate upon Grounded Innovation as it was derived from the qualitative research paradigm. Then we discuss a project example that was conducted applying the Grounded Innovation approach and show exemplary results. Lessons learned and conclusions hint to further refinements of the approach and its application.

PRINCIPLES AND GUIDELINES FROM THE LITERATURE

Literature on the fuzzy front end of innovation has focused on the potential impact and roles of the environment, the organization and individuals within incremental and disruptive innovations (Reid & Brentani 2004). Issues of process and viable degrees of formalization have been discussed (e.g. Buganza & Verganti 2006). While for scientific inquiry not only ethical but also procedural rules for ”good scientific practice” have been defined guidelines for innovation management, particularly regarding early phases of innovation are scarce. It has been argued that only an integrated approach may successfully support intuitive management decisions, and to tailor innovation approaches to the type of innovation, organization, industry and country or culture (Ortt & van der Duin 2008).

Like in process development several challenges have to be faced:

- To combine several methods, believes and ideas together.
- To be easily understood by stakeholders and participants.
- To be flexible and modular to accommodate for different project sizes.
- To not get too theoretical and be based on practical experiences.
- And the largest challenge: To practically implement it.

While these challenges apply to many business processes a characteristic of the fuzzy front end of innovation is its reluctance to formalization. Especially for radical innovation it has been argued that a learning-based approach integrating qualitative market research and investment forecasting is appropriate (Verworn & Herstatt 1999). Reviewing literature and lessons learned from our own projects some preliminary principles and guidelines for innovation projects include:

- Informality: Open space and similar techniques make use of the insight, that good ideas often emerge when they are least expected (e.g. during the coffee breaks at conferences), the organization of activities during the fuzzy front end

of innovation must acknowledge the limits of organization and leave open spaces for informal idea generation and communication to occur.

- Formality: Still formalization is needed to ensure a shared understanding of basic steps and timeframes and manage expectations what is needed and what will result from the activities. Formalization also helps to ensure transparency and set a benchmark for continuous improvement.
- Divergent innovation: Instead of just collecting and selection from all available sources additionally initiate ideation to fill blind spots, dig into and differentiate most promising (or awkward) opportunities respectively areas of interest. (This aspect is out of scope of this paper, but has been elaborated in our previous work – see Breuer, Hewing & Steinhoff 2009).
- Integration of stakeholders and actors: The successful development of an idea within the organization critically depends on the interests of the stakeholders being affected and the actors driving the process and doing the work. For international corporations horizontal participation from various countries needs to be encouraged. Vertically management support from different levels and departments participating is needed to achieve sustainable results.
- Timing and budget: Still, involving for example top-management too early may slow down the processes. "Fuzzy tasks" tend to be neglected and therefore need to be managed carefully with time and budget to be allocated. News and live events keep the participants up-to-speed.

These rather process oriented challenges during early phases of innovation have been considered in the literature. Besides, so far less discussed in the literature, a content-oriented challenge persists. Stuart & Podolny (1996) addressed the local search bias of companies looking internally or within their established cooperative networks for innovation and solutions. As a result they tend to miss peripheral information and unconventional perspectives and end up with solutions in their proximity and already known search fields for incremental innovations. Local search bias may be addressed by integrating new external experts or potential customers into the process. In several ways peripheral information needs to be considered. Especially within dynamic and complex innovation landscapes and markets like information and telecommunication technology currently represent it consists in the huge breath and depth of changing information and developments to be considered while at the same time clear directions are missing and uncertainty persists. The approach we developed addresses these process- and content-oriented challenges.

GROUNDED INNOVATION

The basic approach of inquiry we adapt from Grounded Theory Research as it was developed by Glaser and Strauss in the 1960ies in research on dying hospital patients and staff and adopted throughout qualitative research since. We will briefly review the grounded theory approach and then present our adaptation for innovation development and the identification of potential roadmap topics.

Review of Grounded Theory

In Grounded Theory the development of theories is grounded in empirical data of most heterogeneous sources that has been systematically analyzed. Everything from field observations and interview notes to architectural layouts and quotes from internet blogs or literature, even the researchers own assumptions and knowledge may be treated as valuable and valid data.

The three basic activities of empirical research according to Grounded Theory consist in iteratively collecting and coding data and taking notes (writing memos). Data is collected throughout the process from any source that might provide helpful insight to the topic as such or individual aspects of particular interest. Collected data is being structured and coded on different levels of abstraction. Throughout the inquiry the researcher writes so called memos on everything that comes to mind (like inspirations, implications of codes, new potential concepts and categories and their distinction; see Strauss 1991, 153ff, 174).
Essential for our purposes is the way Grounded Theory applies the elementary concept-indicator model (Glaser 1978; Strauss 1991, 54 ff). This model associates empirical data as indicators to emerging concepts. Comparing indicators with one another in terms of similarities, differences and consistencies in meaning the smallest common denominator may be found and is given the name of a new, preliminary category (also called conceptual code). While more and new data is being reviewed with respect to these preliminary and new upcoming categories additional properties of the categories may be specified until the category is saturated and even new data may be subsumed under known concepts.

We may distinguish between four stages of analysis:

- Codes: Asking generative questions all data is put into a first conceptual perspective oftentimes written in the margin of the field notes. These codes make the data accessible and usable for the following steps. Integrating the most relevant problems and aspects being addressed within the data the resulting codes are the initial names for the essential sequences with the data.
- Concepts: Initially this “open” or “substantive coding” remains rather close to the empirical substance of the research domain. Codes of similar content are grouped into concepts. Widely established labels like age, gender or social class are not predestined concepts unless they explain the data. Preliminary codes and concepts are continuously being modified and changed to fit the data.
- Categories are broad groups of concepts that may be used to generate a theory. Strauss (1991, 63) refers to “axial coding” for the analysis of data and codes around the axis of one category. A tentative core category emerges that explains the relation between substantive codes, and it should also explain the research phenomenon like participant interactions in dealing with a major problem or concern. Gathering new data with respect to the core category is called theoretical sampling; coding old and new data with the core category in mind is called “selective coding”.
- Theory is being developed around a key category explaining most of the variation within the research topic. It is a hypothesis resulting from the research process, and it integrates the different concepts and categories into an explanation of the research subject.

Differences between Glasers and Strauss’ version of Grounded Theory (see Kelle 2005) and further details of the approach may not be discussed here. Instead we adapt the basic approach and exemplify this adoption in a project of a large telecommunication company to fill the future innovation roadmap.

Grounded Innovation Approach

The goal of Grounded Theory is to generate theories about given phenomena like "The social organization of medical work" (Strauss et al. 1985). Still, according to Strauss (1991) it is rather a style of qualitative data analysis than a specific method bound to certain types of data or theoretical interest. We stretched this remark one step further and adopted the approach to identify potential search fields for innovation (instead of theory) based on the vast amount of data on innovative developments in research, technology and society. The result of this inquiry will still be a hypothesis: about the potential economic impact the resulting search fields of innovation may have.

As in Grounded theory the hierarchical aggregation of knowledge and generation of insights proceeds through different stages of analysis. While Grounded Theory proceeds from data and codes to concepts and finally theory, in innovation development we proceed from finding business opportunities to areas of interest and finally search fields. These terms need to be tailored to the particular industry (telecommunication in our case) and project goals.

In general terms a "search field" confines an area for the exploration of business potentials. An area of interest is a search field within a search field, more focused and specific, still broad enough to cover a complete cluster of business opportunities. A business opportunity enables business. For innovation management we defined the basic notions of search fields, areas of interest, and business opportunities as follows:

- Search Field: A search field confines area for exploration of business potentials in terms of generating revenue or reducing costs. It delimits an area for future investment with sufficient potential for return on investment (ROI). It is not a trend, product, or feature, but it may be specified by relating trends and high impact developments in business, technology or society. (The term is adopted from computer science. Here "search field" refers to a field in a record or segment whose value is examined in a search.)
- Area of Interest: An area of interest is more focused and specific, a search field within a search field. It is broad enough to cover a complete cluster of business opportunities, and may only exist in one country or be driven by only one of the constituting factors (e.g. different global or micro trends, competitive or regulatory conditions, strategic or revenue targets).
- Business Opportunity: Business opportunities enable business, include a reason why and a rough quantitative estimation or projection of market size or cost saving potential. It is a "finding" derived from data and relating to the areas of exploration (areas of interest and search fields). According to the literature, a business opportunity only exists when four integrated elements (need, means to fulfill the need, method to apply the means to fulfill the need, method to benefit) are present within the same timeframe and most often within the same domain or geographical location.

An initial example may illustrate this: A research paper reports a new technology for a mobile wireless local area network (WLAN) router. Extracting the most relevant information from a telecommunication perspective, and enriching it with market and customer data we may describe a business opportunity arising from this new technology. Other opportunities are found within home automation, domestic robots,

and wireless communication networks yielding an area of interest that may be named Home Robotics. Combining this with other areas of interest and taking trends like demographic changes and individualization across European countries into account a search field like Assisted Living may emerge. In a last step such search fields may be discussed in the context of future scenarios.
The figure below shows an overview of these essential concepts and the relation between various contributions to the basic framework of Grounded Innovation.

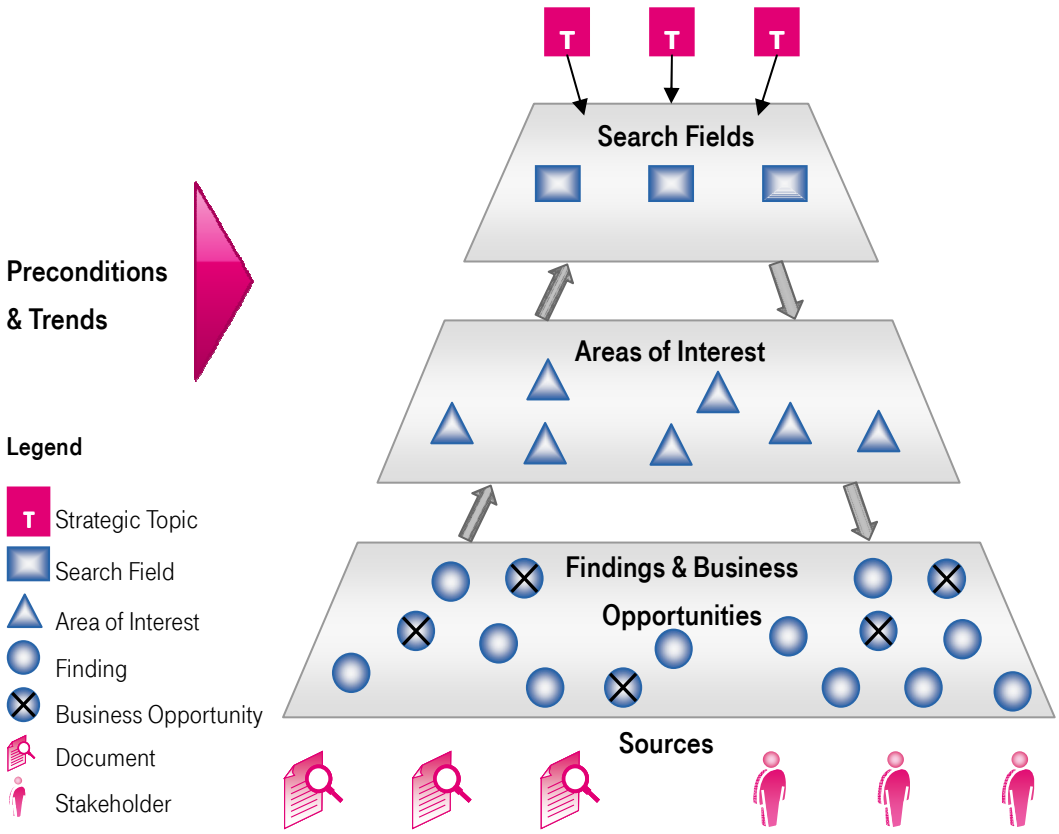

FIGURE 1:
FRAMEWORK FOR GROUNDED INNOVATION

Starting from the bottom of this pyramid a vast variety of materials may be reviewed. Internal and industry reports, publications on new products, trends and research results, market relevant data and customer insights reports, even newspaper and online articles on somehow related fields may and should be considered. Since not all parts of these documents will be of interest only those parts that contain information on potential business opportunities for a company, industry or strategic move (see Kim & Mauborgne 2005; 9ff) should be extracted and saved with their reference into a database for later retrieval. Any time throughout the process additional information on new aspects and topics emerging from the exploration may be collected and integrated.

One should also utilize existing knowledge within the organization to identify sources and to contribute insights and information. In order to do so one may design and distribute simple questionnaires or apply advanced methods like information pump or

information markets. The mobilization of internal knowledge does not only help to broaden the knowledge base by utilizing and integrating even peripheral sensitivity, perspectives and inspirations. It may also help to promote the project throughout the organization and to ensure buy-in from relevant stakeholders.

While information from documents and stakeholders is being collected the analysis – or in the terminology of Grounded Theory – coding starts: Key findings are being identified and named for each piece of information, for each fragment from a document, and each contribution of a stakeholder. Some findings may already represent business opportunities while others serve as simple findings and potential indicators for concepts, respectively for areas of interest. Similar findings and opportunities may be clustered and qualified into such areas of interest according to the specific collection of indicators. Additional information may be needed in order to saturate an area of interest or a search field. While this is done in a bottom-up fashion first aggregating findings into areas of interest and then areas of interest into search fields, two types of impacting factors support the structuring of the material.

Strategic topics stem from within the organization and ensure that the result of the process is not completely beyond the given strategy of the organization. While the generation of search fields is a strategic endeavor itself, strategic decisions from top management need to and may easily be considered while structuring the material. For instance: Differentiation by means of devices and features is a strategic topic for most telecommunication companies. Reviewing reports of new three dimensional displays, on flexible screens, and on micro-projection technologies may yield an area of interest dealing with displays within a search field of new devices fostering collaboration in a business context. Some of the resulting search fields will then be aligned with strategy while others may suggest extending or even challenging strategic assumptions.

Preconditions and trends refer to influencing factors from outside the organization. Preconditions for future business may result from market regulation in the privatization of industries or global trends like demographic or large scale climate changes. Trends refer to current large scale or small scale, long- or short-term changes in society and technology development (on microtrends see Penn 2007). These external factors impact the success of future innovations and may help to structure the materials looking for the next big things to come.

The result of this process is a collection of qualified search fields and areas of interest that are already enriched with numerous opportunities for business (or hint to blind spot on the innovation landscape if indicated search fields are missing substance). These opportunities, areas of interest and search fields may then form an initial proposal to fill the products and innovation roadmap and trigger discussion on innovation strategy. The whole approach allows integrating deep, broad and rich materials from various sources, to integrate internal and external input and sources of information and still provides a transparent way to collect and structure information and to manage potential innovation.

CASE STUDY: FILLING THE PRODUCT AND INNOVATION ROADMAP

We tried to work with this approach and to refine it within a project of a large telecommunication company. The project was called pipeline project and aimed to drive revenue and save costs by the identification of search fields, areas of interest, and business opportunities for the innovation roadmap. Therefore we did not focus on technological innovations only, but acceptable results included for example promising new business models, sales strategies, prizing schemes, collaboration and partnering models, service and product development as well as enhanced modes of interaction at customer touchpoints. Potential search fields were limited to those where return on investment was expectable within three years in one up to six European countries.

About 500 internal and external documents have been reviewed and coded by means of tags. Tags were used to indicate areas of interest, but also helped to cluster findings that shared the same tags. Sources we reviewed included:

- Technology trends especially from an internal publication called Technology Radar. Using an international network of scouts it scans and reports about worldwide research and development in new information and telecommunication technologies.
- Customer insights collected from previous projects.
- Results from several ideation workshops to generate promising new business opportunities and search fields. Usually domain experts from outside the established company networks as a response to the problem of local search.
- Market trends e.g. from market research studies from within and outside the company.
- Competitive watch, economic and business reports from within and outside the company e.g. from analyst reports.
- Internal documents e.g. on revenue targets and strategic topics.

The whole process was supported by a service provider and took about three months. Together we performed the following activities:

1. **Screen**: Screening and aggregation of above sources with respect relevant findings and potential business opportunities. Transfer of conceptually essential data from sources into findings.
2. **Interview**: Online-interviews (questionnaires) with company representatives from several countries have been conducted in order to identify additional findings and business opportunities, or even potential areas of interest.
3. **Cluster**: Within a clustering workshop a preliminary collection of findings was clustered to form areas of interest, and afterwards preliminary search fields. Five of the search fields have been more or less derived from subsuming areas of interest under strategic topics, in addition to the strategic topics four new search fields have been generated.
4. **List**: Generate a preliminary list of search field candidates and areas of interest from previous findings.
5. **Enrich**: Explore and add most relevant market and consumer trends to enrich previous findings and estimate their relevance; alternatively identify blind spots for trend-based scouting, ideation, and divergent innovation (Breuer, Hewing, and Steinhoff 2009).
6. **Consolidate**: Consolidation workshop to consolidate technology and market trends, and to identify additional blind spots for follow-up investigation.

7. **Present**: Presentation of all results as preparation of a management meeting.
8. **Review**: Analysis of lessons-learned and refinement of the process after the management strategy meeting.

Different organizational roles participated in these activities:

- Core team members participated in all essential activities.
- Contributors were responsible for internal sources that contribute to the pipeline
  (e.g. Technology Radar, Products- and Services Radar …) - ideally they conduct an initial screening and extraction of available materials.
- External service providers may help to screen and extract sources and materials, to aggregate information, conduct and document workshops and help to manage the whole process.
- Stakeholder (e.g. country representative) provide problem descriptions but also findings, business opportunities and potential areas of interest e.g. with respect to regional markets.
- Managers review the process and its results and decide on follow-up activities.
- Evaluators are internal stakeholders and external users that provide feedback and evaluation to intermediary results on all levels.

(Using these activities, roles, and defining artifacts a full process may be lined out.) As a major result of the first six steps 9 search fields and 46 areas of interest have been identified. Each of the nine search fields is impacted by one or two major trends. Corporate policy requires that most of the detailed results need to be kept confidential. Still, to illustrate and communicate the approach it will be sufficient to describe one example that already has been reported in the related literature – the search field of open collaboration.

Open collaboration in a broad sense enables business customers to use advanced information and communication tools to efficiently collaborate within companies and beyond company boundaries. The business trend towards open innovation (Chesbrough & Appleyard 2007) represents a way to create and sustain value for organizations together with business partners, colleagues, customer or even competitors. It was identified as a major impact and integrating factor of the search field and the areas of interest it was generated from. These five areas of interest were:

- Cloud computing refers to IT services based on the Internet, transporting business operations to the “cloud”, the web.
- Software as a service (SaaS) refers to web-based software applications to support collaboration between business partners, colleagues or customers.
- Data sharing refers to documents and files that are shared between business partners, colleagues or customers.
- Social networking refers to social interactions between group of people sharing a common interest or goal, taking place in the web.
- Finally collaboration refers to group of people or organizations sharing information and knowledge to pursue common interests and goals and build consensus.

Numerous findings from various sources and several business opportunities contributed to each of these search fields. Virtual capacity was one of these opportunities contributing to areas of interest like data sharing and cloud computing. Virtual capacity is online computing and storage capacity for data backups and computation providing business customers with flexible access to any data or process from anywhere at anytime. Amazon Web Services and Zimory (http://zimory.com/) are known examples that are already working to exploit business opportunities of virtual capacity.

In order to differentiate the search field we collected additional drivers in terms of technological preconditions and customer needs through desk research. It showed that intense web-based innovations and rising use of social software and composite architectures result in new generation of collaboration services – transforming the way customers interact. (Cain 2009). At the same time high acceptance of web 2.0 technologies among customers leads to increasing demand of corporate collaboration platforms based on these techniques (Mann 2009). Challenges were addressed with respect to technology, barriers for customers – like security-related concerns – and the competitive landscape. As far as possible from the literature review we finally tried to quantify potentials for revenue and cost reduction and potential effects for positioning. At the time of publication these results are still under discussion for roadmap planning 2011.

In the case of open collaboration plenty of information and findings contributed to the differentiation of the search field in terms of areas of interest and business opportunities (even though we only compiled brief extracts within this paper). In another cases promising search field candidates have been identified within sufficient support by contributing information. In some of these cases iterative literature research provided missing information. In other cases dedicated scouting activities or even workshops with external domain experts will be necessary to evaluate and differentiate unsaturated search field candidates. Follow-up activities will therefore include trend-based scouting within search fields with insufficient supporting evidence and regarding those trends that are not yet reflected sufficiently with the existing areas of interest and search fields.

CONCLUSIONS

While many, even large technology oriented companies relying on innovation success collect new ideas in an ad hoc fashion governed by chance we presented a systematic yet open ended approach to identify business opportunities and search fields for innovation. The whole process outline may be described in terms of activities, roles, and artifacts. It adapts qualitative social research methodology and knowledge generation by means data analysis and abduction.

Both, in Grounded Theory and Grounded Innovation higher levels of synthesis and abstraction as well as the final hypotheses do not automatically result from following a given procedure and an aggregation of given data. As it is typical for qualitative research the researchers and their experience become themselves instruments of development. Led by intuition an inquirer combines seemingly unrelated facts to come up with a new, integrated perspective. This generative aspect of scientific inquiry has been referred to as abduction (Pierce 1958, relating to Grounded Theory see Kelle 2005).

In this view scientific inquiry begins with abduction, a process of inference that produces a hypothesis as its result. Acknowledging the necessity of formal and informal aspects in early phases of innovation this may be considered strength of the approach combining formal and, mediated by individual experience, culture-driven moments (Khurana & Rosenthal 1998).

Since the approach is agnostic against the origin of sources, internal or external, or data on competitive moves or strategic moves (Kim & Mauborgne 2005) it is not limited to the identification of incremental innovation. Still, the results may only become as valuable as the contributing sources. Establishing such a process also allows a continuous collection and evaluation of relevant publications and materials in order to improve the quality of the input and the process itself.

Grounded theory is established as a solid approach to collect, analyze and integrate rich data from a variety of sources. For this purpose we adopted the qualitative research approach in order to tackle the fuzzy front end of innovation and to identify search fields in the management of innovation. This attempt proved to be viable to identify search fields and to propose candidates for the products and innovation roadmap in a structured way. Follow-up discussions and decisions will determine if the approach may be communicated as being transparent, reliable and valuable enough to become established as a standard for managing innovation at the fuzzy front end with an eye on upcoming roadmaps for innovation.

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