Best Practices for a Responsible Innovation Process :

Application to a Car Manufacturer

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Abstract

Responsible Innovation seems to undoubtedly becoming an inexorable and necessary trend. That is, society calls for a higher embedding of values and ethics within the innovation process, especially with regards to sustainability. However, so far practical application of Responsible Innovation frameworks remains mostly at policy or academic level, while it is still scarce at firm level.

Furthermore, innovation process' enhancement in the highly-competitive automotive industry has become a hot topic in the last decade, especially given the increasing pressures from consumers and governments, towards more sustainable vehicles while still maintaining competitive pricing. However, not all car manufacturers can be considered as highly-innovative as it may appear from an industry with such a tough and complex environment and technical development pace.

This thesis carries out a case study of one of those firms (SEAT), and through a benchmarking framework, it intends to point out the most significant performance improvement areas when compared to the best-in-class firms from a cross-industry range, regarding the innovation processes of new product development. The emphasis is placed on Responsible Innovation, supported by other emerging approaches such as Open Innovation and Co-creation. This benchmarking process lead to an elaboration of a best-practices code for 'product innovation' processes' management, which can be extrapolated to other firms of the automotive industry, as well as the future development of innovation culture change strategies to be carried out within this firm. Coevally, lessons are intended to be applicable to other firms, for allowing cross-industry learning.

These lessons, in the form of best-practices, entitled measures for: increasing participation of all relevant internal and external stakeholders, improving the anticipation for the bi-directional interaction of innovation and the socio-technical context, enriching and deepening the deliberation process, and increasing the capability for responsiveness and reflexivity. These are extensively enlisted as recommendations both for academic and company purposes.

Chapter 1
Research introduction

Chapter 1. Research introduction

1.1. Introduction

Nowadays, companies are facing an increasingly tough business environment. Augmented competition, due to larger number of actors and markets, higher volatility, more demanding customers, globalization and digitalization of society, more stringent regulations, improved financial prospects for shareholders, more innovative products or services, sustainability concerns, etc. are only some of the factors that are placing higher uncertainty and pressure on firms (Griffin 1997, Cooper 2002).

On the other hand, society is demanding for a new wealth model in which considerations regarding environmental sustainability, societal needs, and economic impact are better embedded. That is, integration of the multiple societal values since the early stages of the product or service development rather than just ex-post mitigation measures (Setiawan 2012, van de Poel 2012, Owen 2013, van den Hoven 2013, Von Schomberg 2013). This is especially true for innovative products, which have a higher degree of uncertainty and usually also a higher impact on society.

In order to deal with both apparently conflicting streams, a new holistic approach is gaining momentum among scholars and also firm managers: Responsible Innovation.

This approach emerged especially within policy work in Europe, having significant weight in the *'European Union Framework Programme for Research and Innovation "Horizon 2020"'*, as well as in national initiatives (van de Poel 2012, van den Hoven 2013, Von Schomberg 2013). Nevertheless, it is still an evolving concept, which also has a long road ahead in its implementation within the industry (Setiawan 2012, Singh 2012).

Responsible Innovation implies caring for values concerning social, environmental and economic sustainability. It is therefore supported by five key dimensions: anticipation, participation, deliberation, reflectivity and responsiveness (Setiawan 2012, Singh 2012). In order to reach a higher degree of Responsible Innovation, a wide range of approaches and measures can be taken. For instance, two notable approaches, especially aimed at increasing participation, are Open Innovation and Co-creation.

In the case of automotive industry, it is facing one of the most competitive and challenging business environments, with a significant amount of large and efficient players, as well as under heavy pressure from suppliers, consumers and regulatory bodies, all these resulting into tight profit margins and fast-paced changes (Ili 2010, Barnhoorn 2012). This, together with globalization, places a great emphasis on enhancing the innovation performance of the car manufacturers. However, automotive industry is still far from being considered as a great Responsible Innovation adopter to the date, and therefore there is still significant room for improvement (Ili 2010).

As this thesis is also embedded with the FIS project ("Fostering Innovation in SEAT"), special attention is devoted to the mentioned Spanish car manufacturer. An initial diagnosis (Zahinos 2012) showed significant room for improvement of the firm's innovation process and its 'responsibleness', both at the different stages of the innovation process and the different levels of the organization.

In order to be able to determine the reference points and desirable performance targets of the different aspects of innovation within the organization, a set of best practices had to be developed, by means of an external benchmarking of cross-industry nature, not aimed at direct competitive comparison.

As defined by (Drew 1997), *"benchmarking is the search for industry best practices that lead to superior performance"*. The benchmarking carried out for this thesis is not on the technical or financial performance aspects, but on the innovation processes. All the three stages of the innovation process were analyzed: selection of ideas, adoption and implementation.

In the present document, the different practices for enhancing a more Responsible Innovation process will be analyzed. Following the current introduction, in the **second chapter** the methodology employed for the benchmarking and extraction of the best practices will be detailed. In the **third chapter** the theoretical background and pillars will be laid, and the framework for analysis argued. Next, in the **fourth chapter** the practices identified in the literature are elaborated. After that, in the **fifth chapter** the empirical research will be exposed, firstly reviewing the case of the Spanish car manufacturer SEAT and then presenting the benchmarking results and analysis. Furthermore, in the **sixth chapter** the framework of best practices will be shown, merging those extracted from literature with those of our own empirical research. In the **seventh chapter**, the derived conclusions will be reviewed. In **chapter eight**, managerial recommendations for the case-study company are issued. Finally, in **chapter nine** the research boundaries and reflection and presented.

1.2. Research problem

The problem upon which this thesis emerges is the lack, within the automotive industry, of a unified body of best-practices for improved product-related innovation performance at firm level, that embodies a responsibility approach (Gassmann 2004, Ili 2010, Zahinos 2013). At the same time, society, on a macro level, is being affected by three major trends, namely globalization digitalization and sustainability concerns, which undoubtedly affect to the ways in which firms innovate.

Therefore, the key research problems can be highlighted as:

- The need for increasing the strength (quality) of ideas.
- The need for delivering more robust and responsible products.
- The need to define and select a suitable framework for innovation.
- The need for a clearly defined accountability in the innovation process.
- The need for an efficient mobilization of resources.
- The need for increasing, and incorporating from the start of the innovation process, the social, economic and environmental sustainability.
- The need for a better embedding of the multiple societal values of the different stakeholders involved.
- The need for defining a set or framework of product-related innovation process' best practices, and how to decide which practices can be considered as 'best' or as 'better'.

It must be pointed out, firstly, that currently car manufacturers still mostly rely on what could be called as 'conventional' innovation processes and management, and there seems to be a lack of adoption of (completely developed) Open Innovation practices, despite a large percentage of the innovations employed by them actually have its root from suppliers' efforts (Ili 2010). Furthermore, the Responsible Innovation concept is quickly gaining momentum, mostly due to societal and governmental pressure, but is still far from fully developed, with most efforts so far being devoted to Corporate Social Responsibility, but hardly covering the (early stages of) innovation processes. Many of the firms are facing tough challenges to overcome the combination of over-competitive environment with mounting societal/governmental pressure and increasing pace of innovation. This forces them to look to new forms of knowledge management and look at other firms for having benchmarks on improvements in this area.

Responsible Innovation, as well as supporting approaches such as Open Innovation and Co-creation, are still scarcely adopted within the automotive industry, at least as it has been inferred after extensive literature and website review. In fact, these approaches have emerged only in the last decade, and only leading innovative companies have fully implemented them so far. Therefore, in this aspect a company such as SEAT can find a higher scope for gains as compared to its competitors. Specifically, the firm still suffers from a significant number of deficiencies in its innovation process and embedding the responsibleness within its working procedures. In Chapter 5, the SEAT case and the problem will be detailed.

Therefore, this thesis will be a case study aimed at implementing a (benchmarking) framework and a body of knowledge (best-practices), which can be generalized across the automotive industry, as, will be explained in the Research Objective section. Issues regarding validity and generalizability will be discussed in the sections Research objective and Methodology.

1.3. Research objective

Given the existing problem explained in the previous section, the objective of this thesis can be divided in the following main pillars:

- Creation of a benchmarking framework, reflecting on the product-related Responsible Innovation practices found in other firms, as well as identification of the performance gaps.
- Elaboration of a best-practices code, highlighting the detected overall best processes and procedures on each analyzed aspect of the innovation system.
- Shedding light on why Responsible Innovation, as well the supporting Open Innovation and Co-creation approaches, have not been widely adopted in the automotive industry to the date, and which steps can be taken towards improving this scenario.

Therefore, the final objective of this thesis was to develop a 'formal' best-practices code or framework, by gaining insight from benchmarking cross-industry best-in-class firms, regarding product innovation performance. The code covers all three stages of innovation processes, and wide range of approaches and stakeholders.

The best-practices code output will serve as input for the other FIS project team members that will work on the innovation strategies. While a sequential approach may seem at first glance as the most obvious and simple approach, given the tight time constraints from the project and strong interdependencies, plus the need of close collaboration and constant monitoring, the large part of the activities of the thesis and the project actually run in parallel.

It is worth noting that an intended aim is that this best practices code and benchmarking will be just the first iteration of a longer-term process, which can only achieve its full effectiveness if it is applied unceasingly in time; that is, continuously monitoring the innovation practices from other firms and constantly implementing and re-adjusting new measures for innovation enhancement.

Finally, this case study should allow for generalizability of the methodology, in order to give it sufficient scientific relevance. For achieving this, the measures taken are explained in the research methodology section. Fortunately benchmarking allows gaining insight on a broad spectrum of companies and eventually leading to generalize a set of best practices, which can be applied across the industries.

1.4. Research questions

The purpose of the research can be framed as:

> *What best-practices, regarding responsible product-related innovation processes, can be defined, developed and implemented from a benchmarking analysis of the automotive industry as well as other comparable high-tech, mature industries?*

See glossary for definitions of what 'comparable industry', 'high-tech industry' and 'mature market' refer to in this research question. For definition of 'innovation' and 'innovation process' see Chapter 3.

Sub-questions:

In order to carry out the benchmarking analysis, firstly the partners or analogous firms for the comparison have to be selected. But not all companies or industries are valid for this, leading to the first sub-question:

> 1. *What are the criteria for selecting suitable benchmarking partners, both within and between industries?*

In parallel to the selection of the benchmarked companies, the unit of analysis and variables of the benchmark need to be defined. Therefore:

> 2. *Which dimensions of the Responsible Innovation process should be benchmarked?*

Then, once the benchmarking framework has been established, and its subsequent action plan put into practice, there has to be measurement of the qualitative dimensions of the innovation processes and thereafter of performance gap, leading to:

> 3. *How do the benchmarking companies (qualitatively) perform on the selected innovation process dimensions?*

> 4. *How are the different dimensions of Responsible Innovation integrated within the benchmarking framework?*

The overall compilation of the comparison data leads to the availability of a set of best-practices, which then have to be processed, and adapted to the firm of the case study and its industry. Consequently:

5. Which are the best practices valid for manufacturers across the automotive industry?

Within this question, a significant aspect that has to be addressed is how the benchmarked companies manage Open Innovation, a source of innovation in which the firm and in general the automotive industry seem to be lagging behind. More specifically, how the benchmarked companies integrate the Open Innovation within their Responsible Innovation approach. This can be phrased as:

6. How do the benchmarked companies integrate Responsible Innovation and its dimensions?

Finally, once the benchmarking is completed, the logical following step is to derive what conclusions to extract out of the benchmarked best-practices are relevant and feasible for the case-study firm. Thus:

7. What can the analyzed firm (SEAT) learn from the identified best-practices?

1.5. Methodological approach

The approach followed in this thesis was an empirical research based on a benchmarking methodology with external cross-industry partners. This implied:

- Defining which aspects to benchmark (in this case a set of dimensions from the innovation process)

- Defining the team, approach and planning for carrying out this benchmarking

- Defining a framework of analysis, deriving from the Responsible Innovation approach and other supporting approaches

- Elaborating the data-gathering tools aimed at gathering primary data, namely the survey and the interview, based on the framework of analysis

- Gathering the primary data via deployment of the survey followed by carrying out the interviews, and the secondary data by means of literature review and web scouting

- Analysis of primary and secondary data

- Filtering of the analyzed data, in order to define the best practices

- Understanding the company's context, and thereafter issuing a set of recommendations and action plan

Planning-wise, the span of the present master thesis was of 6 months on-location, in the headquarters of SEAT nearby Barcelona, although it had been preceded of a 3-month preparatory work (focusing on research structuring, planning and literature review).

Overall, the methodology will be reviewed in detail in the coming Chapter 2.

1.6.   Research boundaries

The research had a number of boundaries of the scope in order to provide better focus and feasibility.

- It aimed to analyze only practices attaining, or connected to, the dimensions of Responsible Innovation rather than the entire set of managerial practices for innovation processes.
- It focuses only on product innovations, not on service innovations or process innovations.
- It focused only on firm level, not policy or innovation system level.
- It focuses only on private firms, not on public firms or institutions.
- It places its emphasis on the ideation and development phases, while the final stage of the innovation process (implementation for commercialization of the innovation) is given a clearly lower weight.

The limitations will be explained in more in-depth in 'Chapter 9. Limitations and further research'.

Chapter Conclusions

During the initial stages of this project, by exploring the literature, it became evident that Responsible Innovation was still a heavily evolving concept, with high potential but still with limited number of application examples at firm level. That, combined with the pressing socio-technical trends, lead the research problem, and increased the interest of the research within the Spanish car manufacturer context.

Chapter Summary

In this chapter an outline and purpose of the thesis was shown. Firstly an introduction of the thesis thematic is provided. That is, setting the current context at macro and micro level and an overview of the thesis. Next, the research problem is reviewed. That is, why is it necessary to review the application of Responsible Innovation at firm level and why was the cross-industry benchmarking study necessary. Thereafter, the research objectives are outlined. That is, creation of a benchmarking framework for a Responsible Innovation process, elaboration of a best-practices code, and trying to increase understanding of the adoption of R.I. and supporting approaches within automotive industry. the research question that were aimed to be answered in this study are presented. That is, finding out the best-practices for firm-level towards achieving a more Responsible Innovation process. Finally, it is pointed out the approach outline, that is the methodology used, the project planning and the research boundaries.

Chapter 2. Methodology

In order to tackle the problems and proposed solutions aforementioned in the research problem and research objectives, it was required to acquire a global view of the innovation processes' status quo and understanding which firms are more advanced in this respect. This implied uncovering the current best-practices, for which it was necessary to explore in the external environment. While this could have been achieved by carrying out a desk research literature review, it was felt that it would not provide the desired sufficient added value, and would still not bridge the gap detected on the emerging innovation practices, notably application of Responsible Innovation at firm level.

Therefore a benchmarking methodology was selected as the backbone for supporting the discernment increase, given that it allowed to effectively gaining first-hand external knowledge, and allowed to select and further expand the knowledge on specific areas in which it was felt more emphasis was needed. Benchmarking was considered suitable given that it is more than a mere imitation process, it is a learning process (Massa 2004). Furthermore, SEAT does not aim to be a market pioneer, but instead its strategy could be considered more as 'follower' strategy, therefore it does not need to be the first in implementing. In addition, this benchmarking was not of industry competitive nature, but instead one of cross-industry characteristics, allowing to learn lessons from other sectors which may have not been adopted yet to the automotive industry.

Consequently, in this chapter firstly a brief overview and background of what benchmarking is and which techniques are deployed is given. Next, this benchmarking is adapted to the study's requirements, that is, focusing on innovation processes and a step-by-step approach is proposed. In this approach, the different phases and tools employed during the study are detailed. Finally, the validity of the methodology, as well as of the derived analysis and outcomes (best-practices), are justified.

2.1.   Theoretical background of benchmarking

Benchmarking is defined as *"a market-based learning approach, that can be seen as a structured process by which a firm seeks to identify and replicate 'best practices' to enhance its business performance"* (Camp 1995, Zairi 1998).

Benchmarking is currently a 'hot topic' in management, and an emerging trend especially regarding knowledge-based processes. In the Fig 2.1 below it can be seen how it is increasingly gaining momentum as being regarded as a valuable tool.

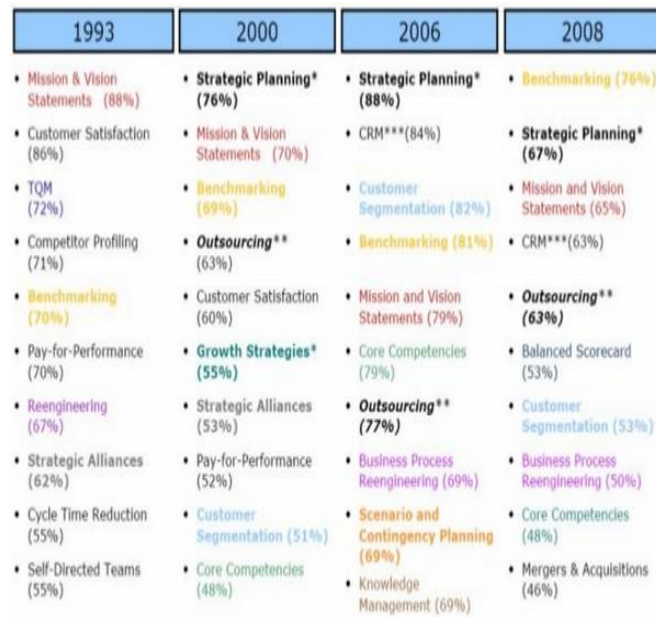| 1993	2000	2006	2008
• Mission & Vision Statements (88%)	• Strategic Planning* (76%)	• Strategic Planning* (88%)	• Benchmarking (76%)
• Customer Satisfaction (86%)	• Mission & Vision Statements (70%)	• CRM***(84%)	• Strategic Planning* (67%)
• TQM (72%)	• Benchmarking (69%)	• Customer Segmentation (82%)	• Mission and Vision Statements (65%)
• Competitor Profiling (71%)	• Outsourcing** (63%)	• Benchmarking (81%)	• CRM***(63%)
• Benchmarking (70%)	• Customer Satisfaction (60%)	• Mission and Vision Statements (79%)	• Outsourcing** (63%)
• Pay-for-Performance (70%)	• Growth Strategies* (55%)	• Core Competencies (79%)	• Balanced Scorecard (53%)
• Reengineering (67%)	• Strategic Alliances (53%)	• Outsourcing** (77%)	• Customer Segmentation (53%)
• Strategic Alliances (62%)	• Pay-for-Performance (52%)	• Business Process Reengineering (69%)	• Business Process Reengineering (50%)
• Cycle Time Reduction (55%)	• Customer Segmentation (51%)	• Scenario and Contingency Planning (69%)	• Core Competencies (48%)
• Self-Directed Teams (55%)	• Core Competencies (48%)	• Knowledge Management (69%)	• Mergers & Acquisitions (46%)

Fig. 1 Management trends (Kohl 2012)

Benchmarking facilitates gaining external knowledge both of explicit and of tacit nature (Lucertini 1995, Drew 1997), which once embodied within the existing firm's know-how derives knowledge for improvement actions in order to bridge the performance gap (Massa 2004). In fact, for enhancing this learning process, it should be carried out following a structured procedure, striving promotion of continuous improvement rather than just punctual action (Massa 2004). But benchmarking goes far beyond just copying from another organization. The process of learning what and how others do actually enhances the cognitive capabilities and therefore allows to extract further conclusions and open the door for new improvements (Massa 2004).

Benchmarking is dynamic in time, it requires a constant search for good example/reference points. The origins can be traced 1950s Toyota, but the term was coined in the 1980s from Xerox (Ross 1999, Besterfield 2003) and was further developed by Ford, Motorola and IBM.

A conceptual model for benchmarking and its success factors was created, and can be found in the appendixes.

2.2. Applied benchmarking methodology

2.2.1. Overview

Firstly, a review of the benchmarking literature was carried out, for understanding the key factors and pre-establish a framework for benchmarking and best-practices. Specifically, concerning the benchmarking of innovation processes, there seems to be limited amount of research regarding methodologies. This may be caused by industry secrecy of such a core issue for the firms' competitive advantage, or due to the fact that benchmarking was originally born with a focus towards production processes rather than less-quantifiable knowledge processes. Alternatively, it could be the case that the qualitative nature of the sought information, available insight was lower than for quantitative benchmarking. It was observed that given the higher novelty and fuzziness of so-called strategic benchmarking, as opposed to mostly-quantitative product or process benchmarking, higher freedom was possible, at the expense of higher uncertainty and validity concerns.

Nevertheless, regarding innovation processes itself there is a solid basis in the literature, which can be used for settling an initial approach for which are the best practices for managing innovation in its three stages (ideation, adoption and implementation).

2.2.2. Step-by-step approach

Benchmarking studies require a systematic and disciplined approach for achieving an efficient process. The reviewed literature suggests various procedures for the steps' order to be followed, but that can ultimately be framed in a similar way. For instance, a simple model of the procedure applied in this study is:

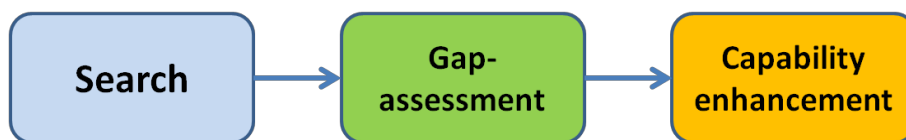**Fig. 2 Benchmarking process, according to (**Morgan 2005**)**

1. **Search stage:** In this first stage, the action plan was laid out, and the critical decision made. This encompasses the following questions to be answered:
   - o **Which dimensions and criteria to benchmark.** For instance, in the case of this thesis, the innovation process for new product development can cover multiple dimensions, such as

management involvement, ideation methods, etc. Within these dimensions, there are multiple variables. For more details, refer to Section 3.4.

o **Whether to do cross-industry benchmark or only within-industry.** According to (Vorhies 2005), which established an empirical base for benchmarking of marketing capabilities, it is highly advisable to carry out also cross-industry benchmarking, even for single-benchmark sites (i.e. taking only the "best in class" firm for a certain aspect, for instance Toyota's new product development process).

o **Amount of benchmarked firms and type:** how many companies per industry and per aspect, whether to benchmark only the "best in class" type of companies, or also other higher-than-average performers, etc.

2. **Gap-assessment stage:** In this stage, the size and composition of the capability gap were uncovered and quantified, and so were its linking and implications to the business performance of the firm.

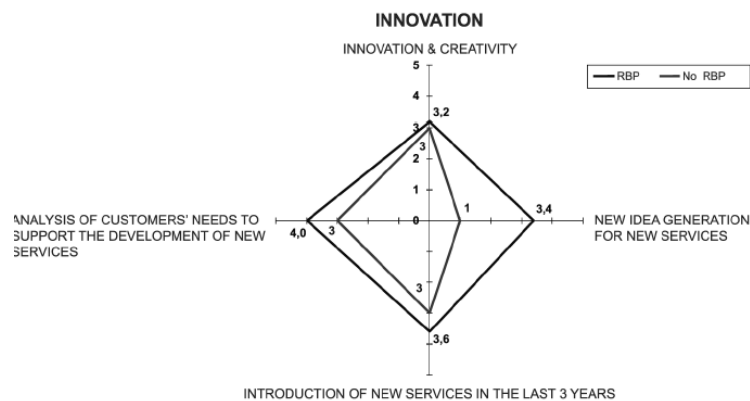Fig. 3 Sample of visual tool for gap assessment (Massa 2004)

3. **Capability enhancement stage:** That is, defining the improvement strategies, where and how to allocate their capability improvement resources, and establishing priorities in case not all the measures are possible within the available resources (Morgan 2005).

Deriving from this, and further detailing, the selected process was framed as:
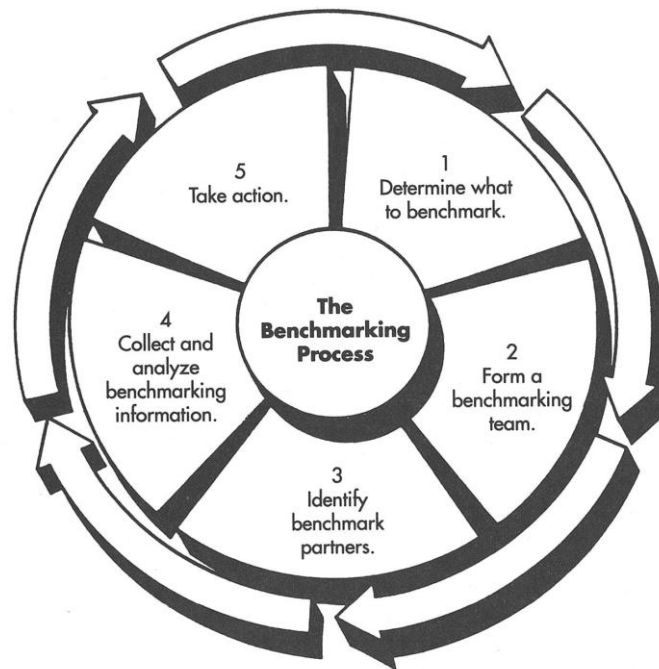
Fig. 4 Benchmarking process (Spendolini 1992**)**

Therefore, this is the adopted approach, as it is explained in detail next.

2.2.3. Phase 1: What to benchmark

This implied defining what the company leading the benchmarking study needs, which specific focus and requirements it has. Afterwards, the resources for achieving it were defined and allocated. Therefore, it also implied defining the plan and methodology, and gathering active involvement from the management and staff. An initial workshop contributes to it, by gathering feedback on the planning and involving the stakeholders.

The selected focus of this benchmarking study was on the innovation process, with special emphasis on Responsible Innovation and the supporting approaches (i.e. Open Innovation and Co-creation). For carrying this task, it was first needed to form a benchmarking team, which required establishing the roles and responsibilities. Given the resource constraints, the team size was limited, but nevertheless considered sufficient for achieving the study's targets and ambitions. A PhD candidate was in charge of carrying out the diagnosis of the current status of the case-studied company, while master student was in charge of gathering the external best-practices and another one for defining the consequent action strategy. Close and continuous collaboration was established for cross-checking the information and process.

2.2.4. Phase 2: Company selection

Cross-industry partners were selected for the study. Criteria definition for company selection has to be a well-devised activity before rushing into data collection. The criteria were defined based on literature review, expert opinion and SEAT's managers' requirements. As (O'Keefe 2005) claims: *"the key for achieving a correct benchmarking is to find partners that share similar processes, whether or not the product is the same"*. Intended criteria is the listed below, however this was limited by the company availability and time constraints. The aim of this election was: Selecting those companies that can provide the study researchers with data that can be used to derive best-practices useful for the SEAT case.

This goal is then de-composed in the following sub-goals and criteria structure, by:

Table 1 Company selection goals (Spendolini 1992, Camp 1995, Cormican 2004)

Similar context to SEAT's	High innovation performance (even despite of different context)	Accessibility and convenience
• Large company • Highly hierarchical • Very competitive and constrained (i.e. regulations) industry • Significant R&D intensity	• Company from highly innovative industry (i.e. healthcare) • Company reputed for certain best-practices aspect/s of innovation (i.e. IKEA in NPD, Philips in consumer-orientation and Open Innovation, etc.)	• Geographically • Openness to participation • Existing direct contacts

Ideally, the companies should be selected only on the basis of the first two dimensions; however practical issues may force to take into account the 'accessibility and convenience' dimension as well. In fact, in this study the third approach was given a relevant weight given practical constraints of the study.

For defining which companies adjusted to the criteria, a blend of gathering quantitative (via for instance annual reports) and qualitative info (i.e. scientific papers, corporate websites, independent business magazines, etc) was needed for establishing an initial list of fitting companies. Then it was intersected with the innovativeness' rankings available (such as (Forbes) Top 100 innovative companies).

Expanding in more detail, the aforementioned dimensions can also be structured by industry and company-specific factors.

Table 2 Company selection criteria (Spendolini 1992, Camp 1995, Cooper 1995, Cormican 2004, Vorhies 2005)

Industry-wise	Company-specific
• Classification of tech / R&D intensity (check OECD ranking of high-tech) (see **Error! Reference source not found.**) • Perceived innovativeness of industry • Type of innovation • Innovation sourcing • Organizational structure /hierarchy • Relation with suppliers • Relation with innovation customers • Open-innovation approach • Co-creation approach • Responsible Innovation approach • Pace of technology change and regulatory pressure • IP protection strategy and importance (high or low rate of patenting, etc.) • Size of industry • Competition • Barriers for innovation	• Innovativeness positioning/ranking within its industry (Best-in-class innovation performance) • Company performance/health (Best-in-class financial performance) • Openness • Nationality (similar nationality and therefore employee/working culture to SEAT/Spanish) • Organizational culture (risk-tolerance culture, power distance, leadership,) • Organizational structure / hierarchy (is it very hierarchical or not? Matrix structure? Flat or very vertical?) • Core brand values and Core competencies (i.e. safety for Volvo, user-friendliness design for Philips, etc.) • Innovation process definition level • Open-innovation approach • Co-creation approach • Responsible Innovation approach • Cross-functional teams and working methodology • Size of company • Geographical location and accessibility

A more sophisticated system, with weigh allocation to each of the variables, could have been implemented. However, it was discarded due to the study's scope and the limited accessibility previously mentioned. The companies that were accessed successfully are listed in the empirical results chapter 4.

2.2.5. Phase 3: Data collection

Regarding the general data gathering, the following methods were employed:

Table 3 Data collection methods (Saunders 2009, Kumar 2011)

• Desk research o Literature review	• Surveys / questionnaires • Semi-structured interviews

o External databases, such as (BenchmarkingNetwork), and company repository	• Workshops • Previous on-site diagnosis data

More specifically, regarding the core topic of this thesis, benchmarking may not only consist of information sharing between companies (for instance, through interviews), but also by means of literature review, databases, surveys and benchmarking reports, which can play a significant complementary role at an affordable cost (O'Keefe 2005). The process for this data collection was structured in three main stages: Preparation, diagnosis and final diagnosis.

In the first stage, which already started in November 2012, a literature review was carried out, covering the topics of innovation processes benchmarking as well as automotive industry-specific context.

In the second, which fully started once on-location, aimed at collecting practical information of the firm for the case study, and will make use of methods such as questionnaires, interviews or workshops (will be elaborated in more detail later in this section); the order in which these methods were deployed was not fully sequential, as each iteration lead to new information and feedback loop, leading to re-adjustment.

Finally, with for instance a workshop was scheduled towards the end of the project timeframe, gathering staff from the different departments of the firm (R&D areas, Innovation, etc.); the purpose of this stage was not only to further collect information and input from the employees, but also gaining involvement from them and management in order to ensure success of the best-practices implementation. The process is schematically shown below:
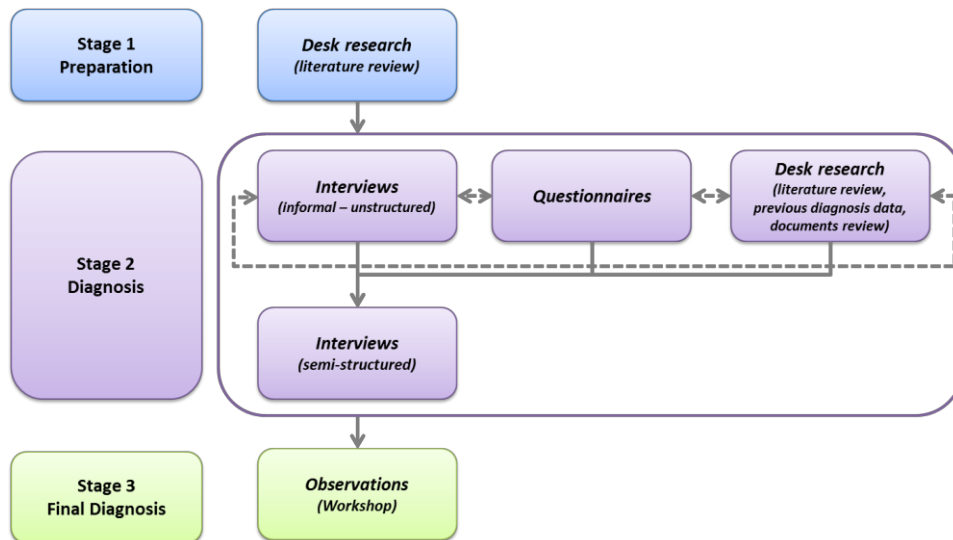
Fig. 5 Data collection process (own elaboration)

Furthermore, based on the research sub-questions, the method for data collection may differ, hence for answering them the proposed methods are shown in the following table:

Table 4 Methodology for each research sub-question (own elaboration)

Research sub-question	Method
What are the criteria for suitable benchmarking partners (within and between industries)?	Literature review Consulting experts
Which dimensions of the innovation process should be benchmarked?	Literature review Consulting experts Semi-structured interviews
How do the benchmarking companies score (qualitatively) on the innovation process dimensions?	Consulting experts Questionnaires Semi-structured interviews
How are the different dimensions integrated within the benchmarking framework?	Literature review Consulting experts Databases
Which are the best practices valid for manufacturers across the automotive industry?	Literature review Databases Questionnaires Semi-structured interviews
How do the benchmarked companies integrate Open Innovation and Responsible Innovation (as a best-practice)?	Literature review Databases Questionnaires Semi-structured interviews
What can the firm (SEAT) learn from the identified best-practices?	Databases Questionnaires

| | Semi-structured interviews |
| | Workshops |

Regarding each method of data collection, the source, procedure and target group is explained in the following:

a. Literature review

Since late November 2012, literature review was carried out, covering the following key topics: innovation processes benchmarking, new product development, Responsible Innovation, Open Innovation and Co-creation. The search of external data, besides scientific literature, relied on web scouting. High amount of data is available from this source, but requires extreme caution about its reliability. Nevertheless, it cannot be ignored especially for the emerging novel innovation approaches, which have only experimented a boom (or even its birth) this past decade, provides more updated and company-specific data than scientific literature.

b. Databases

Internal and external databases were employed. From internal, there were two sources: the company's general repository and the diagnosis from the PhD candidate. The former allowed the use of financial reports and intranet, for obtaining for instance information about organizational structures or working processes. External databases mostly refer to existing benchmarking organizations which offer cross-industry data and studies.

c. Workshops

An initial innovation-related workshop was scheduled, for raising awareness on the need to improve the innovation process, while a latter one was intended to convey the outcomes of the benchmarking process. They encompassed not only internal staff (managers and operational staff) but also external experts, and were recorded and transcripted for a later data-processing and extraction of conclusions. However, due to scope constraints and confidentiality issues, the data generated is scarcely incorporated within this documented.

d. Interviews

Interviews were arranged in order to complete the best-practices' elaboration. The population for this was managers from external innovative firms. From this population, a sample was extracted, by means of purposive sampling (Saunders 2009), based on the criteria: the selected companies had to

be from different high-tech and mature industries, and the managers had to have a strong responsibility in the innovation activities of the company.

Nevertheless, due to complexity of accessibility to the sources in such a competitive and secretive context, the sampling method selected was affected to some extent, almost inevitably, by the 'convenience sampling' (Saunders 2009, Kumar 2011). Not all the initially selected companies accepted to participate, and some of the final participations were selected due to cross-referencing or availability of direct contacts.

Semi-structured interviews were the selected form because they offer, in this case, a suitable compromise: since innovation processes are not a tightly-defined and linear process, they require clarifications and follow-up questions, while still having some degree of structure in order not to lose sight of the final aims (Burgess 1982). Face-to-face offered higher quality of interaction and could allow for addressing topics which were previously unplanned, via follow-up questions. It also allowed for higher rapport between researcher and respondent, and allowed for better reassurance of data confidentiality (Saunders 2009, De Massis 2012)

Questionnaire design.

The design of the questionnaire schedule, which served as guideline of the objectives and topics to be touched, derived from the reflection from the Framework of analysis, which can be found in Section 3.4. Multiple iterations were required ahead of deployment, in order to polish questionnaire, by discussion with scholars and carrying out pre-tests also with externals.

The interview focused especially on uncovering the *"how's"*, as well as *"why's"*, going at a much deeper level of understanding than the surveys. Very valuable qualitative insight was yielded from these interviews. The main topics and objectives of the semi-structured interview are shown in the table below.

Table 5 Semi-structured interview objectives (Singh 2012, Zahinos 2012, Von Schomberg 2013)

Topics	Sub-objectives
Future analysis	- Sources of opportunity identification - Identification methods and tools - Opportunity prioritization
Idea generation	- Improvement of quality and quantity of ideas generated - Methodologies for idea generation
Stakeholders	Improvement of internal and external stakeholders' engagement,

engagement	with special focus on customers
Idea evaluation	• How the evaluation is carried out • How is sustainability assessed
Innovation development	• How it is carried out, and if there is co-development structures in place
Open Innovation	• Challenges of Open Innovation • Steps and capabilities towards implementation of Open Innovation • Modes of partnership • Types of partners
Co-creation	• Challenges of Co-creation • Steps and capabilities towards implementation of Co-creation • Tools and activities for Co-creation
Leading innovations	• Stimulation of innovation leading, including 'innovation champions'
Innovation department	• Role and responsibilities of innovation department

Questionnaire deployment.

In order to deploy the interview, the researchers travelled to on-location of interviewees when possible. Otherwise, in the rest of cases, the interviews were carried out via teleconference.

e. Survey

For gaining a broader spectrum of information and sources than interviews, survey questionnaires were issued to highly-ranked managers of the selected innovative companies. Their mission was to complement the interviews rather than substituting them, by offering higher amount of information spectrum but of lower quality, in the sense that there is no possibility of follow-up questions, uncovering the respondent's non-verbal language, etc. The survey was entirely composed by close-ended questions and completion time was kept below 20 minutes for ensuring participation. The sample of participants was the same of that of the interviews.

Initially a sample of multi-respondents per company was considered, but it implied a risk of distortion and dispersed responses, as well as a higher difficulty of engaging the sufficient number of all companies (Kumar 2011). The survey focused on uncovering existing methodologies and practices within the company, and perceived performance. These surveys were also aimed at providing orientation as to which aspects to especially focus on in each company's semi-structured interview. That is, for instance, if respondents of *'Company X'* mostly pointed out a very significant use of Co-

creation methodologies by the company, then the innovation manager interview would emphasize on this aspect.

Questionnaire design.

Analogously to the semi-structured interview, the survey questionnaire was designed deriving from the framework of analysis (Section 3.4). It was aimed at complementing the interviews, by providing especially an insight on the methodologies and tools used by the respondents for supporting the innovation-related activities. The objectives and sub-objectives may be reflected in more than one question of the survey, and may not be necessarily in the same sequence as in the survey script (the full survey is detailed and explained in Appendix **Error! Reference source not found. Error! Reference source not found.**).

Table 6 Survey objectives (Singh 2012, Zahinos 2012, Von Schomberg 2013)

Topics	Sub-objectives
Strategic orientation and future analysis	• Communication of strategic orientation and challenges • Identification methods and tools
Idea generation	• Idea sources • Methodologies for idea generation • Rewards for idea generation • Co-creation focus and management for idea generation
Idea evaluation	• Criteria and values for idea evaluation • Co-creation approach for idea evaluation
Innovation development	• Involvement of customers in the pre-development
Idea selection	• Methodologies for decision-making
Stakeholders engagement	• Enhancement of participation of internal sources and external sources, especially during idea generation • Importance of informing idea submitters
Open Innovation	• Modes of partnership • Types of partners
Co-creation	• Tools and activities for Co-creation
Leading innovations	• Who leads the innovations and how are they supported • Empowerment of 'innovation champions' • Hierarchy effect
Innovation department	• Role and responsibilities of innovation department

Questionnaire deployment.

The survey was deployed via an online software provided by the university ('Collector', formerly 'NetQuestionnaires'), which allowed for extensive and live global analysis, including via statistical software such as SPSS, as well as Excel and Access, and also an analysis per individual responses. The survey was intended to ensure easiness of use and clarity (for instance, providing definitions of the methodologies listed), as well as a recomforting degree of anonymity (Marra 2006, Kumar 2011). Overall, this deployment delivered highly satisfactory outcomes, proving as a robust and reliable system, both for respondents and for the researchers, and allowing high flexibility for the data analysis.

2.2.6. Phase 4. Data analysis

For processing the survey, it was not intended to deliver a sophisticated statistical analysis and insight, but instead the original aim was to provide guidelines of the general trends and overall view. Therefore, through the use of available online survey, bar charts are simple numerical statistical results were derived, as are shown in Chapter 4.

For processing the semi-structured interviews, while full transcription was initially considered, finally it was opted to only extract and transcript those fragments that directly connected to the interview's original objectives, or were considered to be additional insightful views not previously foresighted. This information was then filtered and revised, through the lenses of the researchers and by double-checking with the interviewees, for polishing potential content errors (Kumar 2011).

This 'editing' implied examining the collected data to detect and mitigate existing errors, information voids or wrong classifications of the analyzed data (Kumar 2011). That is, revising the contents completeness and internal consistency of responses (Kumar 2011). As first reviewing approach, it was opted to scrutinize all responses per one respondent at a time (as opposed to checking per each question all the answers), given it proves more adequate for a global perspective and internal consistency checking (Saunders 2009, Kumar 2011).

Finally, it was incorporated throughout the line of reasoning, sub-divided in different dimensions, outlined in chapter 4. These means that conclusions and quotations extracted from the interviews are intertwined and embedded with surveys results as well as researchers' argumentations.

2.2.7. Phase 5. Performance comparison and application

Once the data had been collected and the best-practices defined, they had to be adapted to the specific context of the company, as is described in detail in Chapter 4. To this end, workshops proved an effective tool, as the first lessons learnt inspired the management and employees, improving the support towards change (Karlöf 2003).

The following logical stage was to take a number of steps to reach the target fixed by the best-practices. Per dimension, the current status and the reference points were qualitatively compared, defining which dimensions show a higher performance gap. To enhance the understanding of them, multi-dimensional charts are favoured, as it can be found in Chapter 5. Finally after these steps, action plans were derived, including the transition towards re-design of the firm's internal process (out of this thesis' scope). It is also recommended that in the future follow-up visits are carried out, as a feedback loop, for gaining further insight and to further re-adjust and apply new measures (Ross 1999, Besterfield 2003, Karlöf 2003).

2.2.8. Validity

This thesis is framed as a case-study research, with an exploratory nature. Case study is considered as especially suitable for analysis of the product-related innovation process (Cormican 2004). Furthermore, this election is due to the fact that the topic is reliant on and cannot be fully detached from the context, and the boundaries between the phenomenon (the innovation process) and the context are not fully evident. Specifically, the context within SEAT, and the context of the automotive industry. Nevertheless an issue arising from this is the generalizability (which will be tackled extensively later, at an early stage of the thesis elaboration).

In order to achieve valuable results, this study has to satisfy the conditions of construct validity, external validity and reliability, besides resolving those of generalizability. A form of solving some of these potential dangers is the use of triangulation. In this case, the type selected is data triangulation. That is, employing more than a single source of information for gaining understanding on a certain topic. For instance, multiple sources (i.e. persons of different profiles such as managers and engineers, different departments, different firms) as well as different methods (such as questionnaires, interviews, observations, etc.). If the results gathered from the different sources and methods are convergent, it can lead to supporting the validity of these.

Specifically, in this study source of data originated both from secondary research (in the form of scientific literature review and website scouting) and primary research (via online surveys and face-to-face interviews, as well as workshops), for ensuring validity via triangulation and higher richness of conclusions (De Massis 2012).

Note that other types of triangulation were not extensively applied due to constraints of scope and time, as well as the desired research approach).

2.2.9. Best-practices justification

Why are best-practices needed is already clear at this stage. But the question that arises next is: How are the best practices selected? Specifically, in this introductory page the aim is to briefly answer the following questions:

1. What are the criteria for best practices? Why are they best-practices?

These practices are extracted from the companies that are considered as 'best-in-class'. This 'best-in-class' term can refer to:

- Companies leading overall performance in their industry (i.e. sustained financial performance). However, literature still has not fully established correlation between overall performance and innovation best-practices.
- Best performing on a specific aspect (i.e. Ikea is considered a best-in-class in logistics, Philips in Open Innovation, Ducati in Co-creation, etc) (Cormican 2004).

2. How can they be proved as 'best'?

Many of the best-practices enlisted in this framework are already validated in extensive surveys from literature, which studied hundreds of companies, from wide range of low and high-tech industries (Griffin 1997, Cooper 2002). They are also backed by sound logic of studies on the fields of behavioral psychology and management.

However, it is more difficult to prove it for the (very) recent approaches of innovation (for instance Open Innovation, Co-creation or Responsible Innovation) since they have been adopted since barely a decade, or even more recently in the case of many industries such as automotive sector. In this case, the most obvious procedure is to directly observe the overall performance of these leading companies since the adoption of these methods.

Of the listed best-practices, some are found to be consensus-based or applied by majority of the best-in-class companies. However, other best-practices are traced from a single company or a small group, on the base of the assumption that since that specific company is excelling in performance of that specific aspect, the related practices is solid. This assumption can prove risky and not fully validable. But given the nature of this study and that gathering a large sample of companies was out of scope, it has been decided to nevertheless opt for adopting this approach too, nonetheless stating the warning of the made assumption.

Furthermore, the qualitative nature, rather than quantitative, makes the process of best-practices validation more difficult to be objectifiable and measurable.

3. Can best-practices in one area be 'best' in other sector (specifically, to the automotive industry)?

The majority of the competences are valid cross-industry. For instance, having an effective leadership or an intra-entrepreneurial climate are aspects effective for all (innovative) companies, as they form part of the base of the universal managerial practices valid for organizations of all sorts (Cooper 2002).

Nevertheless, some practices will need adaptation to SEAT's context (not only industry-wise, but also to specific working culture, innovation strategy, etc). For instance, Co-creation platforms may have to be implemented differently in the car industry (focusing on a large base of end-users) than in the pharmaceutical industry (focusing not only on patients/end-users, but also on experts and doctors, with higher preparation and lower number of participants). But taking the cases of Ducati's or BMW's Co-creation platforms, for instance, can already provide a solid context-adapted perspective (De Massis 2012).

Chapter Conclusions

It was found that application of benchmarking methodology to innovation processes was still moderately reported in the literature. Therefore, the methodology used for this study was elaborated on the basis of qualitative managerial benchmarking and adapting it to the body of knowledge on

Innovation processes and Responsible Innovation. For this an action plan was shown, for gathering insight from primary and secondary data and to apply to the case-study company.

Chapter Summary

In this chapter the methodologies applied for carrying out this thesis were detailed. Firstly, it was explained why benchmarking was selected as the core tool for operationalization of this thesis, and a brief theoretical background was given. Also the characteristics selected for the benchmarking are explained; that is, a non-competitive cross-industry study. Next, the applied process is detailed. That is, the steps taken for selection the study population, collecting the data and analysis. Finally, the validity of the study and its outcomes is argued.

Theoretical framework & best practices from the literature

Chapter 3. Theoretical background and framework

In this chapter the theoretical foundations for the thesis are presented. This implies giving a perspective of the innovation process and how Responsible Innovation intervenes within it. In order to do so the reasons for emergence and the theoretical implications of R.I. will be explained, as well as the approaches that can support its implementation. Deriving from this, a framework of analysis will be proposed, which will serve as backbone for the data collection and analysis that is elaborated in the following chapters.

3.1. From Innovation to Responsible Innovation

Innovation and technological trends have had a significant impact on the socio-economic context and the environment, at both local and global level (Singh 2012). The phenomenon is embodied by what (Schumpeter 1934) described as the 'creative destruction', that reflected the correlation between the technological developments and the business cycles. Creative destruction was defined as the *"process of industrial mutation that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one"* (Schumpeter 1934).

In fact, this factor may have for instance accounted for as much as 80% of the USA's overall economic growth in the 1909-1949 period (Solow 1957), a bold finding that earned the Nobel prize to Robert Solow. This phenomenon translated into increased job and wealth growth, reduction of poverty in significant areas of the planet and increased live expectancy (Singh 2012).

However, (Schumpeter 1934) and subsequent innovation-related academicians failed until recently to also compute and consider the drawbacks of these developments and how they can be minimized. In fact, this growth also had negative side effects which should be prevented in advance and call for a higher accountability from the technology drivers (that is, especially researchers and innovators) (Dorbeck-Jung 2013).

Furthermore, as the 2009 Lund Declaration points out, it is crucial to address, during the R&D, the needs from society and the ethics' concerns (van den Hoven 2013), something that to the date is done by firms only to a limited extent. That is, the need for a *i*nclusive and holistic approach of proceeding during the innovation processes in order to facilitate all stakeholders that are, at an early stage, implicated within the innovation process, to:

- Ascertain and anticipate all the necessary information regarding the consequences of their actions, as well as the possible alternatives.

- Therefore evaluate the results and alternatives with regard to the needs from society and ethical values

- Hence incorporate these deliberations within the inputs and functional definitions in the R&D and design process (van den Hoven 2013).

Therefore, Responsible Innovation emerges in order to respond and address these gaps, with a holistic perspective that carefully tries to cover the multiple dimensions that innovation affects.

It is worth overviewing how Responsible Innovation transcends the theoretical abstraction level. That is, how Responsible Innovation becomes a 'reality'. In order to do so, academicians and practitioners have developed a number of approaches which tackle the issue at stake from different perspectives, and normally focus on different aspects. The most renowned approaches are Constructive Technology Assessment (CTA), Value Sensitive Design (VSD) and Corporate Social Responsibility (CSR). Additionally, other existing approaches are Midstream Modulation and Reflective Equilibrium. Furthermore, there are emerging trends and approaches which also enhance the introduction of Responsible Innovation, being two good examples of which the Open Innovation and Co-creation approaches, which greatly expand the base of stakeholder participation. All these approaches will be explained in more detail in Section 3.3.2.

Thus, in the coming sections firstly the innovation process in general will be reviewed and next the focus will be placed on how it can be addressed by means of the principles of Responsible Innovation. These will be merged and embodied in the subsequent framework of analysis.

3.2.   The innovation process

Innovation is defined in widely varying ways in the literature, but the basis definition selected for this thesis frames innovation *"as the successful introduction into an applied situation of means or ends that are new to that situation"* (Mohr 1969), and from Porter's perspective: *"to include both improvements in technology and better methods or ways of doing things. It can be manifested in product changes, process changes, new approaches to marketing, new forms of distribution, and new concepts of scope…[innovation] results as much from organizational learning as much as from formal R&D"* (Porter 1990).

Therefore, a firm qualifies as being highly innovative when it is able to consistently realize improvements in technology and/or better methods, be it of products, processes, business, etc. (West 1990) defines innovation as *"the intentional introduction and application within a role, group, or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual, group, organization or wider society"*

This thesis focuses on product innovations. By product innovation, here it covers any innovation regarding the development and final result of the vehicle, and that will provide added value to the customer. Therefore it also comprises the consequential *'services'* that it delivers to the end-user, such as improved comfort, reduced fuel consumption, improved reliability, etc; however other service innovations (i.e. a new form of guarantee or insurance, leasing scheme, etc.) are considered out of the scope.

In order to keep coherence with the practical application of the process, the selected definition for innovation is taken from the perspective of the automotive industry. For instance (Bratzel 2012) argues that product innovations in the automotive industry can be framed as the *" improvements that are of special economic significance for the respective vehicle manufacturers and accordingly to the passenger cars market.* These improvements have to satisfy the following conditions in order to be considered as innovations under this view:

- *" offer additional appreciable customer profits that differ from previous improvements"*
- *"be presented by the respective vehicle manufacturers in an appropriate way so that they could be perceived by a broad audience"*
- *"be available in form of products able to be produced in (pre) series or rather be presented at least in form of prototypes (studies)"* (Zahinos 2012).

Specifically, the Innovation Management Department of Volkswagen (the parent company of the studied SEAT firm) defines product innovation in the following way: *"a product innovation within the development process of a product (PEP) is a novel solution that offers a significantly increasing and visible benefit to the customer through improved and additional services and functions. This change in the customer value allows a significant differentiation from competitors. Thereby special attention must be given to the establishment of unique selling propositions (USP). Moreover, innovations are to increase value of the company stakeholders, customers, employees, investors and society"* (Zahinos 2012).

Therefore, a firm can be considered as being highly innovative, in terms of product development, when the company is able to consistently deliver novel solutions that, by means of improved and additional services and functions, provide a significant increase and visible benefit to the customer.

(Schumpeter 1934) classified innovation into five main categories: new product introduction, new production methods, new markets' opening, creation of new market structures in an industry and finally development of new sources for raw materials or inputs. This thesis focuses on the first type of innovations, those concerning introduction of new products. Alternatively, product innovation can be classified, based on their 'newness' and according to (Stanski 2009), as:

Table 7 Product innovation categories (Stanski 2009)

New to the World products	New product lines
Additions to existing product lines	Improvements and revisions to existing products
Repositioning	Cost reductions

The innovation process, for enabling effective analysis purposes, was structured in three main stages (Zahinos 2012):

1- **The front end (ideation and selection):** this stage encompasses 'idea generation', 'idea evaluation', 'idea detailing' and 'idea selection'.

2- **Innovation development:** refers to the development of the selected ideas' concept.

3- **Implementation for commercialization:** covers the post-development and the steps towards commercialization of the innovation.

These require already having in place a well-defined innovation strategy and analysis of the future technological and market trends, and actions for adapting to these. Such input could be a sort of 'Stage 0', which in this study it has been decided to be called' Strategic orientation'. These activities are "*established prior to the generation of ideas, in which the organization defines which strategic approach it wants to follow and which are the market developments that will affect its product innovation needs. The purpose is the identification of innovation potentials and the formulation of specific innovation activities for the company*" (Zahinos 2012).

The transition from stage 1) to 2) is marked by the decision-making point by which the corresponding top-manager of selection-making team gives greenlight and allocates resources to the development of an idea (Zahinos 2012). The development phase refers to the innovation development activities in place for the company to evaluate the attractiviness of the idea and the repercussions of its

implementation for commercialization (Zahinos 2012). Finally, the implementation concerns the application of the innovation to the final (commercialized) product. In this thesis, all three stages are covered, although higher emphasis is placed on the first two, due to considerations from literature and the company's improvement needs.
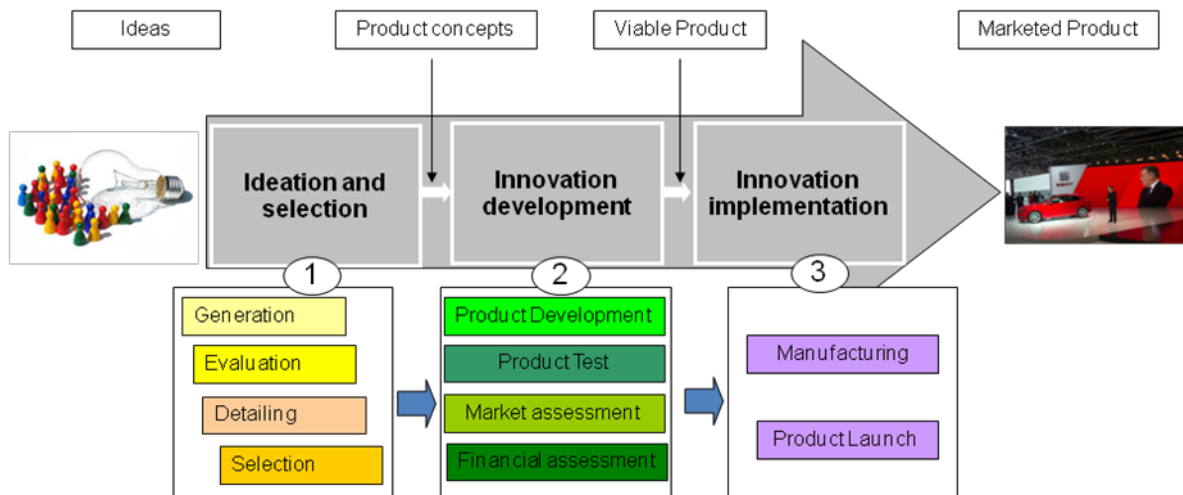

Fig. 6 Innovation process stages [Own elaboration based on (Zahinos 2012)]

Finally, to give a perspective of why the enhancement of 'product innovation process' is so crucial, it is interesting to remark that:

- New product lines (<5 years-old) represent an impressive 33% of the sales revenues (Cooper 1993, Stanski 2009).
- For each concept/idea that became successful, another 6 failed. For each successful development project, another 3 had failed (Hamilton 1982, Cooper 1993).

The stage-gate model

Firstly, it has to be stated that the approach taken in this report, for evaluating the innovation process, is heavily reliant on the New Product Development literature. This is due to the abundance and solidity of scientific and applied literature on this concept, which provides solid foundations from which to derive and further explore the novel innovation approaches' application. Traditionally the 'New Product Development' process is a structured and systematic process, formed by stages and gates. The Stage-gate model is defined as a route or 'map' for defining the multiple steps from idea to its launch (Cooper 2008). The aim is enhance the efficiency as well as the effectiveness of the new product development process.

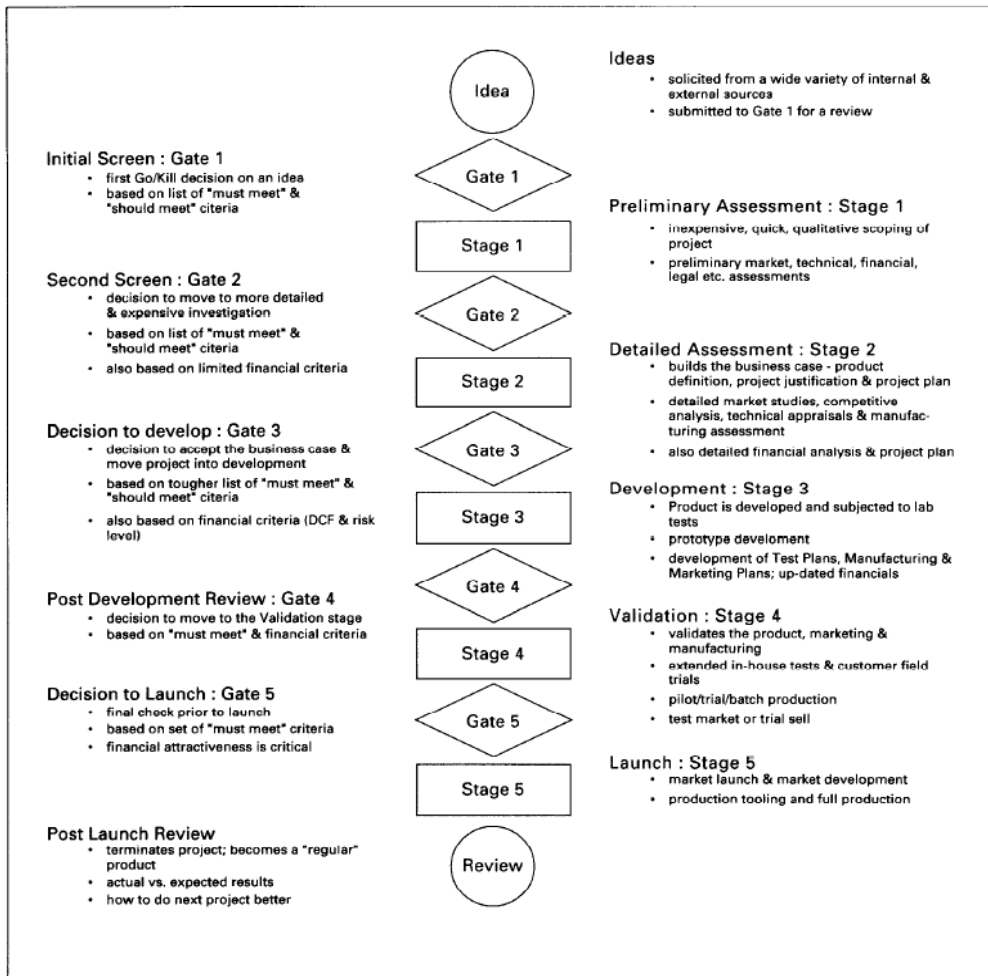**Fig. 7 Typical 'stage-gate' New Product Development process (Cooper 2008)**

The stages and gates are formed by a number of subcomponents and tasks, as shown in the figure below.
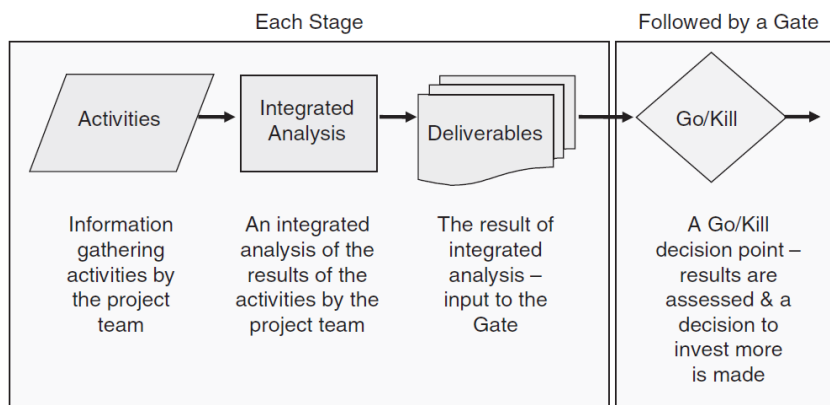

Fig. 8 Composition of the Stage-gate components (Cooper 2008)

Stages: formed by a group of best-practice actions in order to reach the following gate (Cooper 2008). It is important to make the following remarks:

- Efforts and devoted resources increase through the process because each stage requires an increased commitment, but also uncertainty (and risk) decreases.

- Stages are not necessarily structured sequentially, but they can be carried out in parallel or overlap. The same applies to the activities within a stage. Feedback loops are also possible.

- Cross-functional teams, from departments of R&D, marketing, production, etc are involved throughout all the process.

Gates: these go/kill control points are formed by three components:

- **Deliverables.** For instance, reports of completed tasks from the previous stage. They should be transparent and communicated to employees, having a specific set of characteristics depending on the phase of the innovation process and decided at end of the preceding gate (Cooper 2008).

- **Criteria.** There are two types: *'must-meet'* criterion, in the form of checklist, and 'should-meet' criterion which are measured and added via a score model, the latter being employed for the project's prioritization.

- **Outputs.** This implies the decision made and a resultant action plan (with resource allocation and timeframe), as well as the inventory of deliverables and an established scheduling for the following gate (Cooper 2008).

This model was first formally developed by Robert G. Cooper (Cooper 1990, Cooper 2008) and is now a successful and widespread model. Good examples of effective application of this model are best-in-class firms, for example 3M, Procter & Gamble, ITT and Emerson Electric (Griffin 1997, Cooper 2002, Cooper 2005).

Nevertheless, precautions have to be taken, as suggested by (Cooper 2008). Firstly, structured and systematic does not necessarily mean rigid and highly bureaucratic. While many companies have interpreted it this way, this seems far from ideal, and even Robert G. Cooper raised concerns on the matter, claiming his original view was misunderstood (Cooper 2008).

Other ill-fated outcomes of this misinterpretation are that some projects may miss activities or steps, as well as missing supporting resources (i.e. leadership, organizational structure) and fail to reach the suitable quality and time of execution (Cooper 2008).

Regarding best-practices of innovation process, most of them have been embedded within the novel innovation practices. However, some aspects may be out of scope. But since these usually account for 'traditional' approaches, which have been widely studied in the literature, they are not included here. Instead, it is recommended to review the following seminal or relevant papers: (Cooper 1993, Griffin 1997, Cooper 2002, Cormican 2004), etc.

3.3. Responsible Innovation

3.3.1. Theoretical background of Responsible Innovation

Responsible Innovation is defined here as *"being caring or ensuring care for certain values for social, economic and environmental sustainability by engaging in anticipation, reflexivity, deliberation, responsiveness and participation for bringing up any change in any idea, product, process, method, way of business, technology, etc to bring them in specific market or use in specific society"* (Singh 2012).

Nevertheless, it is worth noting that this concept is still continuously developing and being further explored (Setiawan 2012, van de Poel 2012, Owen 2013, van den Hoven 2013, Von Schomberg 2013).

The purpose of Responsible Innovation is to prevent negative impacts or unsuccessful adoption of an innovation derived from insufficient consideration and embedding of values of society (Owen 2013, van den Hoven 2013, Zahinos 2013). Because innovations can indeed produce unexpected outcomes (Setiawan 2012) which may not necessarily be positive. Furthermore, it can potentially increase efficiency of R&D efforts and solving existing societal problems (van den Hoven 2013).

The need for Responsible Innovation arises from the increasing demand by stakeholders to place greater accountability on technology developers. These have to take measures to shape their innovation process in order to produce outcomes which are satisfactory and desirable from an ethical, social and environmental point of view (Von Schomberg 2011, Zahinos 2013).

Translating this to the specific case of the automotive industry, the different actors need to reshape their process in order to speed up the more environmentally-friendly transport technologies while at

the same time maintaining the societal and economic wealth by means of providing to society financial improvement and employment (Zahinos 2013).

That is, for being a responsible innovator, the company has to consider certain values towards ensuring the three component of sustainability:

- **Social** sustainability
- **Economic** sustainability
- **Environmental** sustainability

These considered values can be, for instance: cooperativeness, transparency, safety, autonomy, accountability, ownership, community, collaboration, universal usability, trust, identity and poverty (Singh 2012). While many of the values are universal, some may well be culturally-specific (i.e. sense of ownership may be more relevant in USA than in Sweden) (Setiawan 2012).

In the case of SEAT, it is interesting to review the case of electromobility services development, shown in (Zahinos 2013). For the development of this, the authors collaborated with workers from SEAT in order to formulate a development process that was sticking to the Responsible Innovation principles. In order to do so, they tried to incorporate within the project core values such as, among others, safety, environmental sustainability, collaboration and cooperation (Zahinos 2013).

If these societal values are missed, it can potentially lead to negative outcomes, namely high probability of adoption rejection by society or of reaching a lock-in of a less beneficial solution. (Zahinos 2013) mentions genetically-modified wheat failure in Europe as an example of the former, while use of pesticides shows a real case of the latter negative outcome.

In order to be considered a Responsible Innovation process, it has to deeply embody the following 5 dimensions defined by (Setiawan 2012, Singh 2012):

Fig. 9 Responsible Innovation dimensions (Own elaboration)

1. **Anticipation:** It implies analyzing the plausible future and foreseeing the impacts of the activity or action taken.

2. **Participation:** Engagement, or at least involvement, of the different stakeholders in the innovation process. For enhancing this dimension, the Open Innovation and Co-creation approaches are especially suitable, and are detailed later in this section.

3. **Reflexivity:** Points at the cause-effect relationship the innovation has with its context and stakeholders, which lead to a feedback and re-shaping cycle.

4. **Deliberation:** The deep and careful evaluation and exploration of the multiple characteristics and implications concerning the innovation.

5. **Responsiveness:** Addressing or responding to the emerging circumstances from the multiple requirements and needs, values and perspectives of stakeholders.

It has to be noted that these dimensions are necessary conditions, but not always sufficient. It also worth noting that it was decided to frame this thesis within the framework established by Singh, but there are other differing definitions of Responsible Innovation and its dimensions. For instance, (Owen 2013) divides it into four components or dimensions, namely anticipation, inclusive deliberation, reflectivity and responsiveness. This effectively implies merging participation and deliberation as mutually interconnected.

For firms such as SEAT, it can be argued that on their perspective the ultimate corporate aim is achieving sustainable (financial) profitability, by means of following a Responsible Innovation strategy. Sustainable here could be seen as multi-dimensional: that is, not only in terms of for instance being

environmentally-friendly or socially respectful, but also in the sense of achieving a long-term financial profitability and overall's societal economic welfare.

While the company does not formally name it as Responsible Innovation, the aspects of it are already growingly embedded within their mission and vision. Quoting from their 2011 annual report: "*SEAT devotes all its efforts to driving forward the sustainable development of its activities so that it is both profitable while at the same time goes deeper into its commitment to environmental protection, social progress and transparency in its actions*" (SEAT 2011). Furthermore, their CEO of that time, James Muir, states that "*… we must increase sales volumes, increase profitability and improve quality.*" (SEAT 2011), and remarks the social component of the company in the current financial crisis: "*we are setting an example for Spain*" (SEAT 2011).

It is therefore important to understand how this framework is actually applied, and therefore which methodologies are used or which approaches are aimed at enhancing the dimensions of Responsible Innovation. As (Zahinos 2013) claims, implementing Responsible Innovation implies following strategies for implementing Open Innovation and Co-creation, by means of for example carrying out interactions between companies and customers that are more transparent, open and responsible, in order to adapt to the new societal paradigm, co-creating value.

3.3.2. Existing approaches towards supporting Responsible Innovation

In order to put Responsible Innovation into practice, there are already existing frameworks and methodologies. The most known of these, at least within academics, is the Constructive Technology Assessment, which provides a holistic and anticipative view, that places special emphasis on augmenting the participation of the affected stakeholders. However their application to the date has been mostly at academic or policy level (van den Hoven 2013) rather than firm level (van de Poel 2012). On the other hand, there are some other more industry-oriented emerging practices, namely Open Innovation and Co-creation, that also attempt at increasing stakeholders' participation, although they don't cover all the dimensions and can only be considered as supporting pillars towards full implementation of Responsible Innovation. All these approaches are reviewed in more detail in the coming sections.

Hereby in this section, firstly the currently most common approaches for Responsible Innovation are listed and briefly explained. However, note that these approaches are not the main focus of this thesis. The reasoning behind this is that they are already strongly adopted theoretically, yet also still scarcely

adopted at firm level. Instead, the Responsible Innovation best-practices are categorized and explored through the lenses of the five aforementioned dimensions, by for instance analyzing how approaches such as Open Innovation and Co-creation can enhance the participation and anticipation dimensions. Open Innovation and Co-creation were the two approaches selected given that are two strongly emerging and effective approaches increasing the participation of stakeholders, external stakeholders and customers respectively. Other analogous approaches were not evaluated due to scope constraints and the focal interest from the managers of SEAT.

Constructive Technology Assessment (CTA)

It is argued that CTA broadens the design, development and process of implementation for the evaluation of socio-technical effects (Schot 1996). The differentiative aspect of CTA is that it focuses on the *"dialogue among and early interaction with new actors*" (Schot 1996). Basically, it implies to extend the consideration of a wider spectrum of stakeholders and of factors related to the technological development (van de Poel 2012). Therefore, it is needed to enhance the learning on social impacts and management of technology within society, as well as reflexivity (for stakeholders' views and roles, for technological dynamics and for shaping of these dynamics) and anticipation (in terms of future technological developments and the impacts on society) (van de Poel 2012, Zahinos 2013). However, it has to be remarked that CTA does not focus on values (van de Poel 2012).

Three generic strategies for CTA are: strategic niche management, technology forcing and also loci for alignment (Schot 1996). Interestingly, CTA has been adopted only marginally by private companies or technological shapers, but instead the main adopters are still governments and policy makers (Schot 1996, Zahinos 2013).

Value Sensitive Design (VSD)

According to its first developer, Batya Friedman, "*Value Sensitive Design seeks to provide theory and method to account for human values in a principled and systematic manner throughout the design process"* (Friedman 2013). The emphasis is placed on stakeholder analysis (both those affected directly and indirectly), on the differing values (designer values, technology-supported values and stakeholders' values), on different levels of analysis (at individual, group and social levels) as well as on the process of multiple iterations of *" the integrative and iterative conceptual, technical, and empirical investigations"* , and finally the *"commitment to progress*" (Friedman 2013).

Midstream Modulation (MM)

Can be defined as a methodology *"in which an 'embedded humanist' interacts in regular meetings with researchers to engage them with the social and ethical aspects of their work"* (Fisher 2006, Flipse 2012).

Reflective equilibrium in R&D networks

Its goal is to reach an overlapping consensus, by analyzing three main dimensions: *"Considered moral judgments on a particular ethical issues, ethical principles and background theories"* (van de Poel 2012).

Corporate Social responsibility and codes of conduct

As defined by the European Commission, CSR is "the responsibility of enterprises for their impacts on society". To fully meet their social responsibility, enterprises "*should have in place a process to integrate social, environmental, ethical human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders*" (Commission; 2011).

A code of conduct is defined as *"principles, values, standards, or rules of behaviour that guide the decisions, procedures and systems of an organization in a way that (a) contributes to the welfare of its key stakeholders, and (b) respects the rights of all constituents affected by its operations"* (Accountants 2007). It is narrower than CSR and has a more internally-oriented approach.

The most important tools for the different methods above are:

Table 8 Tools for applying the R.I. approaches

VSD	Assessment with direct (users) and indirect stakeholders (other affected parties), value scenarios, value dams and value flows and envisioning cards (Nathan 2007, Czeskis 2010, van de Poel 2012, van de Poel 2013)
CTA	Socio-technical scenarios, concentric scenarios, multi-level scenarios, CTA workshops with broad variety of stakeholders (Mulder 2011, Parandian 2012, van de Poel 2012)
MM	Inclusion of humanist, participant observation, engagement tools, asking questions to people in laboratory (discusses issues and gives feedbacks) (Schuurbiers 2011, van de Poel 2012).
Reflective equilibrium	Chart relevant network, actors and stakeholders, sessions with relevant actors and stakeholders (in order to trace relevant moral issues), interviews with relevant actors and stakeholders (in

	order to deepen insight in moral issues, background theories, etc), judgments of networks in terms of three procedural norms (learning/reflection; openness /inclusiveness; complete and transparent allocation of responsibilities), feedback to technological researchers (Daniels 1996, van de Poel 2010, van de Poel 2012)
CSR	Mission statement, company codes of conduct, selection and training of personnel, monitoring and Auditing (internal or external), dialogue (internal and external), confidential advisor, whistle blowing policy (Hanke 2009, Vilanova 2009, van de Poel 2012)

Corporate Social Responsibility is currently the most publicly-known form of Responsible Innovation. However, CSR is probably not sufficient to provide SEAT an edge over competitors, and has the danger of being perceived by customers and stakeholders in general more as an image-improving strategy rather than a sheer societal-responsible effort. While most large corporations are implementing and communicating the use of CSR, some societal doubts arise about their full responsibility (van den Hoven 2013). For instance, very recently the CSR Observatory stated in a study that 33 out of 35 companies of the Ibex 35 (Spain's main stock index, which lists the 35 Spanish companies with highest market cap value) have assets in tax heavens (ElPaís 2013).

Open Innovation

Open Innovation is defined here as it was first defined by Henry Chesbrough as "*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*" (Chesbrough 2003).

Open Innovation has two main components, two knowledge flow directions: inbound (outside-in) openness and outbound (inside-out) openness.

- Inbound openness implies seeking outside the organization for new sources or partners that can enhance or complement the organization's capabilities (De Massis 2012).
- Outbound openness can defined as the courses for 'sending outside' the IP or projects that may not suit the current business portfolio or aims of the company (De Massis 2012).

The main strategies for applying these two dimensions are listed below:

Table 9 Modes of Open Innovation partnering (Viskari 2007)

Inbound	Outbound
In-licensing, Alliances and other collaborative research projects, Acquisitions, Venture investments, etc	Out-licensing, Spin-offs, Joint ventures, Strategic Alliances, etc

Which methods to apply heavily depends on the company's internal and external context, and there does not seem to be a consensus about the best approach. This issue is addressed in the coming Open Innovation's 'identified practices' section.

The Open Innovation process model is usually represented as permeable funnel (as opposed to rigid one of closed innovation), in which ideas are filtered but may easily enter or exit the company's funnel, as in the figure below:
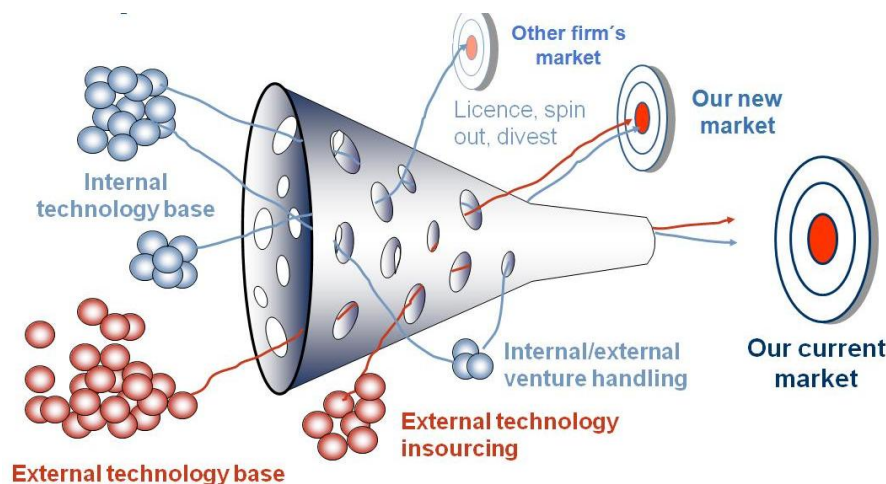

Fig. 10 The Open Innovation process funnel (Chesbrough 2006)

The new Open Innovation paradigm mainly differs from the traditional 'closed' setting, according to Chesbrough, in a number of aspects such as:

- The increased role of external knowledge and of active IP management, taking new shapes and with new players such as innovation markets and intermediaries (i.e. independent websites such as Ninesigma, Innocentive, etc).

- The increased focus on business model consideration;

- The acknowledgment that R&D projects' evaluation may miss opportunities, for instance if the innovation is not aligned with the core business (Thiele 2012), and therefore that there can actually be 'purposive' outbound knowledge flow.

- And finally that the new innovation paradigm requires establishing a new set of metrics for measuring the firm's innovation performance (Thiele 2012).

Open Innovation therefore represents a revolution to the current concept of how to innovation and can deliver new significant advantages. As a concept formally defined only 10 years ago, it seems to be early to fully outline all the benefits (and risks) of such an approach. However, it seems to be agreed

by most sources (Chesbrough 2003, Gassmann 2004, De Massis 2012, Chesbrough 2013) that the potential benefits are tangible and large, even to the point of becoming a 'survival must' for companies to continue being competitive. For instance, zooming into some immediate and practical benefits of Open Innovation with customers and Co-creation contests, are (Bombardier 2012):

- Increasing understanding of customers' needs and wants
- Brand-building, as it projects the image of higher customer-listening and openness
- Better detection of technological and market trends
- Opening the door to an immense range of creativity
- Attracting talent to the company, by being able to detect potential new recruitments

In order to achieve a successful transition towards an open model, a deep corporate culture shift is required. For instance, the 'not invented here' syndrome has to be addressed, in order to reach a state in which employees not only do not reject external ideas, but in fact become enthusiastic about them (Dilk 2008, Bartl 2010). This is nevertheless a demanding task, which can take significant time and effort, and setting up suitable conditions, concerning factors such as organizations culture and capabilities, firm's strategy or governance style (De Massis 2012). This will be elaborated further in the framework, although addressing all the aspects of the transition strategy remains out of this study's scope.

Open Innovation in the automotive industry

At this stage, it has to be noted that not all industries have adopted the Open Innovation model to the same degree, and for instance the automotive industry still has a long road ahead in this respect (De Massis 2012). While closer collaboration and integration with suppliers, for the development rather than just production, has been a strongly growing trend in the automotive industry, the openness to other external stakeholders, such as customers or universities, is still rather limited.

But the need for change is inevitable. The environment car manufacturers are facing is expected to push them to look outside, to implement Open Innovation models. For instance, factors such as globalization, higher technological development pace, more demanding customers, R&D expenditures, higher cost pressure and mergers and alliances (Gassmann 2006, Ili 2010).

Specific literature on the Open Innovation application in this industry is also still scarce, and mostly of very recent publication (De Massis 2012). In order to grasp the progress of this industry in the Open Innovation aspects, it is essential to outline the analysis carried out by (Ili 2010). An insightful

perspective of this progress is provided by the following Fig. 11, in which the automotive industry's degree of adoption in the 6 main dimensions of Open Innovation are rated.
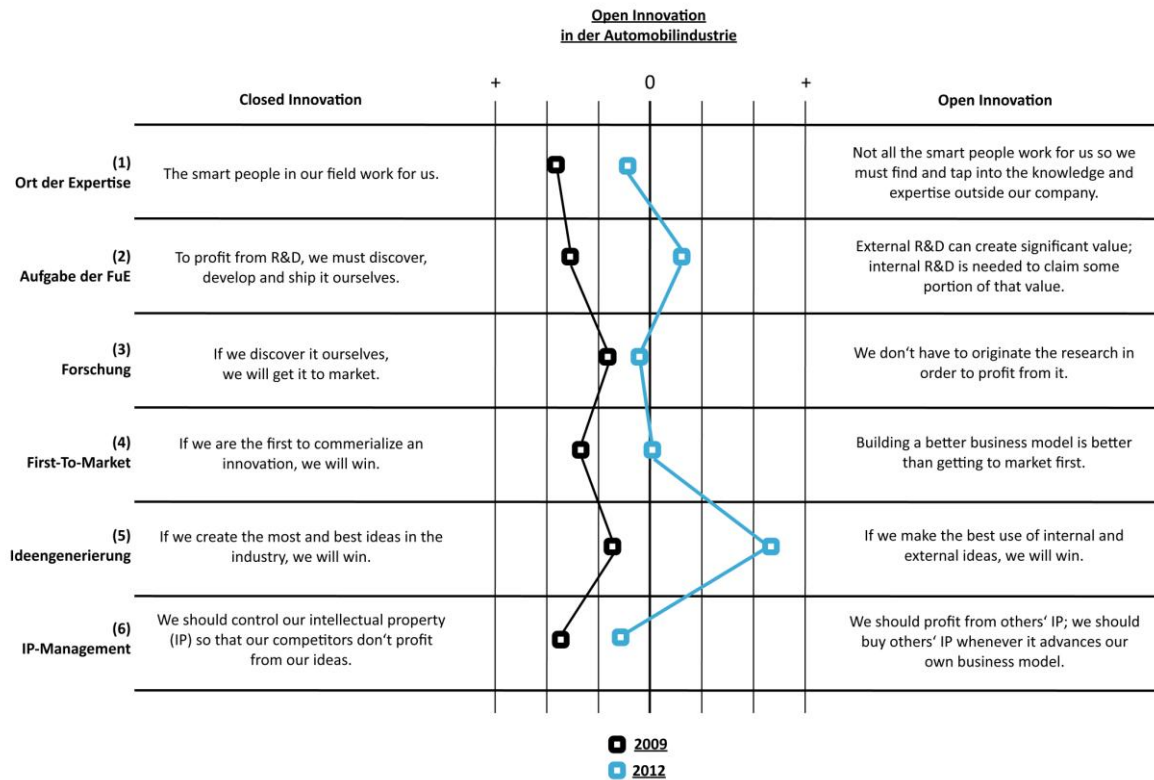

Fig. 11 Progress of implementation of Open Innovation in automotive industry (Ili 2010)

It can be inferred that in this industry, while fast improvements seem to be taking place, there is still a long period before the transition is fully completed, and that the automotive manufacturers are still lagging behind compared to other sectors, such IT companies. It is especially remarkable, from this report and from other literature, that the automotive firms are clearly aware of the need to harness leading ideas from outside too, given the extremely competitive pressure they are under; however, they are extremely cautious and protective in terms of know-how and IP. This is reflected in the fact that while inbound openness is adopted in a significant degree, outbound openness is still uncommon among this industry (De Massis 2012).

Nonetheless, it is important to mention that this provides an overall picture of the industry but Open Innovation's adoption is far from homogeneous among the different players of the industry. For instance, some firms are already quite advanced, such as General Motors (with its OnStar system that Henry Chesbrough already mentioned when coining the Open Innovation concept) or BMW (which runs its own Co-creation lab and very collaboration with suppliers and universities) (Thiele 2012). Also, a number of manufacturers have established mechanism for 'looking outside', in the form of 'trend

scouts' or even of more active tools such as BMW's Virtual Innovation Agency or Volkswagen's global Innovation Marketplace (De Massis 2012). An innovation result of the Open Innovation activities is BMW's iDrive (De Massis 2012) which emerged in collaboration with companies from other industries, notably the young company Immersion, which was selected after technology scouting from their office of Palo Alto (located within the Silicon Valley cluster).

The overall rather timid adoption of the Open Innovation model maybe caused by factors such as the inherent protectiveness and secrecy concerns of automotive manufacturers, as well as the fact that fully adopting Open Innovation is far from being an easy and fast path. Difficulties may be traced even down to more inherent factors of the automotive context. For instance, one specific barrier that Open Innovation adoption is facing in the automotive context is the type preparation and approach of their employees currently in place. It is claimed that frequently their workers lack sufficient and suitable training, as well as lack of incentives, for collaborating and interacting with external staff/partners (Dilk 2008, De Massis 2012).

Referring again to the iDrive innovation case, while the overall outcome was a success, some barriers and issues were faced during this opening process. For example, interaction between Immersion and BMW proved challenging, given the large amount of stakeholders and departments from BMW that had to communicate with Immersion, and accountability and responsibilities proved difficult to establish. Furthermore, BMW's engineers showed some reluctance, as this innovation had not been adapted to the automotive industry before, which could be considered a form of 'not invented here' syndrome (De Massis 2012).

Nevertheless, despite these challenges and barriers, it seems clear that adoption of Open Innovation is unavoidable trend for the car manufacturers (Ili 2010).

Co-creation

The **Co-creation** term was first coined as *"a form of market or business strategy that emphasizes the generation and ongoing realization of mutual firm-customer value"* which *"views markets as forums for firms and active customers to share, combine and renew each other's resources and capabilities to create value through new forms of interaction, service and learning mechanisms".* This is therefore a depart from the *"traditional active firm–passive consumer market"* paradigm (Prahalad 2002). Similarly, is can be framed as *"being able to leverage the collective brainpower and creativity of external sources effectively can accelerate bigger and better innovation",* and also brings down costs of

innovation for companies (Shaughnessy 2012). Nevertheless, forms of Co-creation had been previously applied extensively, most notably in the form of lead users (von Hippel 1986).

Co-creation implies the joint generation of value, by means of bespoke interactions, which vary in time and effort upon the individual customer willingness to engage with the company (Prahalad 2002). This Co-creation concept is, in most cases, referring to company-customer interaction, as opposed to company-company or company-institution interaction. It means to take customers as active creators of value, rather than the traditional view of just 'acquirers' of value or passive participant of marketing research (Ramaswamy 2009).

The main pillars of the Co-creation with users are:

- **Dialogue:** more than just an information flow, it should be a channel for mutual understanding between the firm and the customers. In this way, the firm can also harness the values of customers and embed them from the start of the innovation process. (Prahalad 2002)
- **Access:** implies opening up the perspective of value-acquisition. That is, instead of placing the main emphasis on (product) ownership, the value can be shared or accessed in different parts of the value chain and activities, therefore leading to new business opportunities and customer experience (Prahalad 2002).
- **Risk-benefits:** Co-creation can lead to a sharing of the risks, as the customers not only become knowledge provides, but also take up part of the developing responsibilities and risk-handling accountability (Prahalad 2002).
- **Transparency:** This is fundamental for achieving a fundamental component of interactions: building trust (Prahalad 2002).

Dialogue is considered as the most important of the four, and requires a continuous interaction, by which both parts (customers and companies) forge a strong engagement and proneness to actively collaborate and act (Prahalad 2002). In order to achieve so, the topic originating the Co-creation has to provide value to both customers and company. Furthermore, the 'game' has to be clear, that is, there have to be well-defined guidelines of engagement (Prahalad 2002). It is nevertheless important to define the boundaries of Co-creation, as delimited by (Prahalad 2002):

Table 10 The boundaries of Co-creation (Prahalad 2002)

What Co-creation is	What Co-creation is NOT
Joint creation of value by customer and firm	Customer focus or so-called 'customer is always right'

Allowing customer to co-construct the service or product experience to suit his/her context	Delivering good customer service with lavish service
Joint problem definition and solving	Mass customization of offerings that suit the industry's supply chain
Creating an experience environment in which customers can have an active dialogue and co-construct personalized experiences. For instance, product may be the same, but customers can construct different experiences (i.e. Lego Mindstorms)	Transfer of activities from firms to the customers as in self-service Customer as product manager or co-designing products and services
Experience variety	Product variety
Experience of one	Segment of one
Experiencing the business as consumers do in real time Continuous dialogue	Meticulous market research
Co-constructing personalized experiences	Staging experiences
Innovation experience environment for new Co-creation experiences	Demand-side innovation for new products and services

But, why is Co-creation so relevant? Only in recent years has Co-creation become a 'hot' topic. However, the underlying reasons have been emerging since long time ago. For instance, education and knowledge of citizens, and therefore customers, is ever increasing. This in turn enhances their negotiation power, forcing companies to eventually take on *"an implicit (if not an explicit) negotiation"* (Prahalad 2002).

It is argued that societal dynamics are evolving towards implicit negotiation of value, between companies and customers (Prahalad 2002). In the automotive case, this means that the manufacturer has to 'negotiate' with each individual (Prahalad 2002).

As shown in Open Innovation, Co-creation can deliver significant benefits, mostly concerning increased customer-centric approach. It enriches and supports the decision-making process (Ramaswamy 2009). For instance, it provides a deeper and faster understanding of the customers' needs and wants, detecting new opportunities, which furthermore allow for risk sharing as well as decreased cost (Ramaswamy 2009). It is claimed that Co-creation, be it with users or be it with other external sources, can significantly enhance creativity, knowledge base and capabilities (Bartl 2010).

3.4. Framework of analysis

As mentioned in the Responsible Innovation background section (3.3.1), there are currently significant gaps concerning coupling of innovation processes which are still being addressed. In fact, the existing innovation processes for most business are still distant from incorporating the more responsible views (Von Schomberg 2013). Furthermore, specifically zooming into the Responsible Innovation approach, there are still gaps concerning applicability of certain aspects to the level firm. That is, for instance, the majority of firms are struggling to 'democratize' the deliberation process, as well as to respond with sufficient anticipation to the socio-technical trends and the bi-directional interaction it has with the developed products/innovations (Von Schomberg 2013).

The majority of supporting approaches (i.e. CTA) have been, so far, mostly used at policy or academic level rather than business level. Large corporations like SEAT do not appear to have adopted such perspectives, be it due to their nature, be it due to lack of awareness. Only Corporate Social Responsibility has been widely embraced among firms, but by standards of the evolving view of Responsible Innovation it may no longer be considered sufficient (van de Poel 2012).

Furthermore, other approaches and trends that may be enhancers of the Responsible Innovation, such as Open Innovation, are still heterogeneously adopted throughout the industry, although rapidly rising and more attractive to firms (Chesbrough 2006). This momentum is considered as a good opportunity for introducing Responsible Innovation within firms, benefitting from these 'winds of change', although needs to be backed by further components and to be applied more consistently.

Because, while there is an increase in the consciousness of the Responsible Innovation role, its dimensions and aspects are not systematically embedded by the within the innovation process (van den Hoven 2013). In fact, the gap of lack of application to firms was evident in the recent "2013 IEEE International Technology Management Conference & 19th ICE Conference", on "Responsible innovation and Entrepreneurship" (ICE 2013). The amount of papers focusing on firm level applications could still be considered scarce. This has shown high scope for development in the area, as shown by (Zahinos 2013), and consequently gives significant relevance to this study's objectives and potential contribution.

Therefore, for this analysis, it has been tried to understand how the most avant-garde adopters are consistently embracing these emerging approaches and which practices makes these firms capable of consistently outperforming competitors while still having a more responsible 'behaviour'. Finally, it has

to be noted that the time available for this study posed a limit to this framework, but in the Limitations' chapter, further research directions and expansion of the framework are suggested.

Based on the aforementioned needs and constraints, a framework was laid down in order to understand which specific aspects should be studied and how to structure them. It was decided derive these framework components from the five core dimensions of Responsible Innovation shown in section 3.3.1. The selected dimensions and variables analyzed are presented in the coming Figure and detailed afterwards:
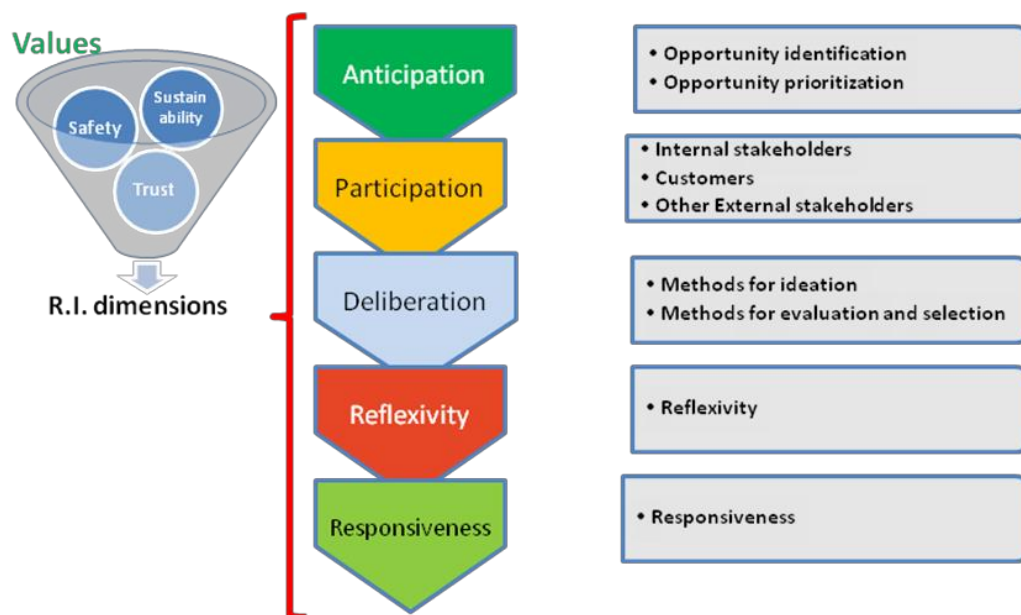
Fig. 12 Dimensions and variables analyzed within the innovation approaches (own elaboration based on (Von Schomberg 2011, Singh 2012, Zahinos 2013)

Anticipation, in company's practical terms, implies that the firm has to:

- be able to predict and act in advance to how will a product or service develop by the company will impact its environment (for instance, users, or society in general).
- be able to understand how the external environment (society, technological macro trends, industry and competitors) will evolve, and therefore how the company needs to adapt to it.

However, the former component has been already extensively addressed by current approaches, such as CTA, and usually concerns design-related and policy-making procedures (Schot 1996). Therefore higher focus for gaining insight was placed on the latter of the two. This component can help companies save resources by avoiding well in advance deploying resources on innovations which may

be later rejected by society. This implies early uncovering and fully incorporating the ethical and social requirements (van den Hoven 2013).

Firstly, for carrying out this anticipation, opportunities have to be identified. This implies scanning through the societal frame to detect technological and market trends, both at macro and micro level (Von Schomberg 2013). In order to do this effectively, the company needs to follow a systematic approach, for which a wide range of methodologies are available, for instance the Delphi method.

Furthermore, once detected, it has to be decided how this set of opportunities is trimmed down, given that the firm's resources are limited and the company is unlikely to be able to tackle all the identified opportunities. This usually implies internal discussions, supported by external advice and support tools such as portfolio management (Eversheim 2009).

Finally, in order to effectively propel these detected opportunities, it is fundamental to communicate them throughout the company (Cooper 2002), increasing the likelihood that internal stakeholders will accept them and engage in their development.

Participation is perhaps the most critical dimension to be studied, and certainly the one that can lead to a higher number of measures and practices, as is seen in later sections. It implies 'democratization' of the process, going beyond the passive and command-and-control involvement of stakeholders. That is, that internal stakeholders are proactively engaging in the innovation activities, that customers are actively asked and interacting with the company for developing ideas and innovation, and that other external stakeholders (other firms, suppliers, universities, etc.) are joining forces in collaborative projects or ventures (Prahalad 2002, Gassmann 2006, Von Schomberg 2013). Each of these stakeholders' groups was given specific focus, paying special attention to not only 'traditional' measures for stakeholders' engagement, but also to Open Innovation and Co-creation.

This engagement process is supported by means of communication, rewards and the role of the innovation department. That is:

- By communicating internally and externally of the company's aims and activities the process can have increased 'democratization' and transparency, which in turn facilitates the keenness of stakeholders to participate.
- By providing rewards and recognition there is a higher incentive for stakeholders to participate.

- By an active, multi-dimensional role of the innovation department, the participation different stakeholders can be better coordinated, and their function can be enhanced (by for instance providing to them the necessary tools and methodologies).

However, plain engagement of stakeholders does not suffice. It has to be complemented by **deliberation** in order to be effective (Singh 2012). Deliberation consequently implies debates among the key and affected stakeholders that shape the innovation process. However, it goes beyond the approval and adoption of innovations or the accountability, and tries to support the Responsible Innovation quest for re-evaluating how R&D and innovation process are put into practice (Singh 2012) (Sutcliffe 2011).

Therefore, key to the analysis are which methods are employed for deliberation during the ideation, evaluation and selection phases of the innovation process. Hence, both in the interviews and the surveys, heavy emphasis is placed on the analysis of the explicitly-mentioned methodologies as well as the implicit cognitive processes undergone during such phases.

Tightly connected with the aforementioned dimension, it is important to understand the feedback loops and cause-effect reactions derived from the process (Singh 2012), that is: **reflexivity**. In order to do put it into practice, deliberative procedures may be necessary for understanding the interrelation, the effects of context in the innovation adopters and vice versa.

In order to address this need for reacting to feedback, as well as existing and previously known factors (i.e. values), the fifth dimension comes into play: **responsiveness**. So, for instance in the analysis of this study, it was pursued to find out how managers are able to respond to the emerging trends or changing conditions, how they respond to the increased 'democratization', etc.

Nevertheless, deliberation, reflexivity and responsiveness have been grouped together throughout the coming analysis for practical purposes, given that during the study it was found that a significant majority of the found practices concerning one of them also related to at least one of the other two. This is especially true for methodologies that support the decision-making processes.

The **values** system of the affected stakeholders heavily determines whether an innovation or process is shaped and becomes accepted, and therefore successful, both during its development and during its commercialization.

This selected 'values assessment' variable is aimed at understanding to what extent and by which tools do company staff assess essential societal values, namely sustainability, transparency, safety, autonomy, identity, accountability, sense of ownership, collaboration, cooperation, individuality, universal usability, cultural differences between regions and trust (Singh 2012, van den Hoven 2013, Zahinos 2013). In fact, not all these values may be universal but may instead be culturally-specific or group-specific; for instance some may apply only to Western countries or to certain stakeholder groups.

For instance, safety is one of the primordial factors embedded since the initial phases of the vehicle design. Furthermore, another case in which the safety value plays a key role for customers and car manufacturers is the so-called 'safety re-calls', in which the companies request users to have their cars revised or fixed for a certain safety precautionary measure. These situations also clearly affect other values such as transparency or accountability.

One especially relevant value, which is given higher attention here, is **sustainability** and its assessment. Sustainability in this innovation context stands for achieving a socio-technological development and economic growth without compromising the longer term, the future generations (Singh 2012).

Assessment of sustainability means how companies evaluate and ensure the environmental, social and economic sustainability. That is, which methods and which stakeholders are involved for effectively managing an innovation process that reaches sustainability.

Overall, it can be stated that the five dimensions of Responsible Innovation facilitate embedding the values system within the innovation process, and therefore achieve the sustainability aims.

Chapter conclusions

It can be inferred from the reviewed literature and analysis of industry that the Responsible Innovation concept is still strongly evolving and far from fully mature, and while its application at policy level is already significant, at firm level it is still scarcely adopted, including within the automotive industry. However, it is a promising concept and there is still scope for making bug strides and further deepening the knowledge basis on it. Nevertheless, in order to tackle it when dealing with firms, it may

be more practical to address it by means of the aforementioned dimensions and variables, as most of the managers are still not fully aware of the holistic view of the Responsible Innovation approach.

Chapter summary

In this chapter the theoretical foundations of the thesis were laid down. Firstly, the innovation processes and the concept of Responsible Innovation are detailed. That is, how the societal values and its relevance and how they are enhanced and incorporated within the innovation process by means of the five Responsible Innovation dimensions (anticipation, participation, deliberation, reflexivity and responsiveness). Then, the supporting approaches that contribute to reaching a more responsible innovation process, such as CTA, CSR, Open Innovation and Co-creation are explained and some practical orientation is given, trying got shed light to what extent they have been adopted at the industry's level. The last two were found to be especially suitable for the intended industry application, and make a big contribution to enhancing participation of stakeholders. Finally, the framework for carrying out the analysis of the data collected in the benchmarking is detailed. This framework is based on the five dimensions defined by (Singh 2012): anticipation, participation, deliberation, reflexivity and responsiveness. This have embedded the societal values, with special emphasis on sustainability (in environmental, social and economic terms).

Chapter 4: "Better" practices identified from the literature

Elaborated here are practices that allow the enhancement towards applying Responsible Innovation, found in the scientific literature and scouting of more informal literature such as corporate or websites or business magazines, while the full extraction of the generically-applicable best-practice will be elaborated in Chapter 6 Framework of best-practices. They are structured by the dimension that they ensure. Many of them may touch more than one dimensions, and therefore are listed within the dimension that they enhance to a greater extent.

a. Anticipation

For instance, BMW's Technology office was created as 'listening post' in order to anticipate trends as well as sharing knowledge with other industries, benefitting from California's avant-garde corporate climate and high-tech innovativeness (BMW 2008).

Philips is also very active on the outlook for future trends and how to adapt and strategically orient them company to fit those future scenarios. In order to increase the speed of product development and adapt to the market changes faster than its competitors, the brand, created a 'blockbuster' accelerate team (Wielens 2012). It moved on from "growth challenges from the categories to scouting, evaluating acceleration options to handover and ramp---up of the products in the business" (Wielens 2012). In Fig. 13 it is illustrated how the Dutch firm is evolving from a 'traditional' approach, in which there is an internal exploration for defining future projects and products, to a more advanced and open approach, in which the future prospects are sought by looking outside.
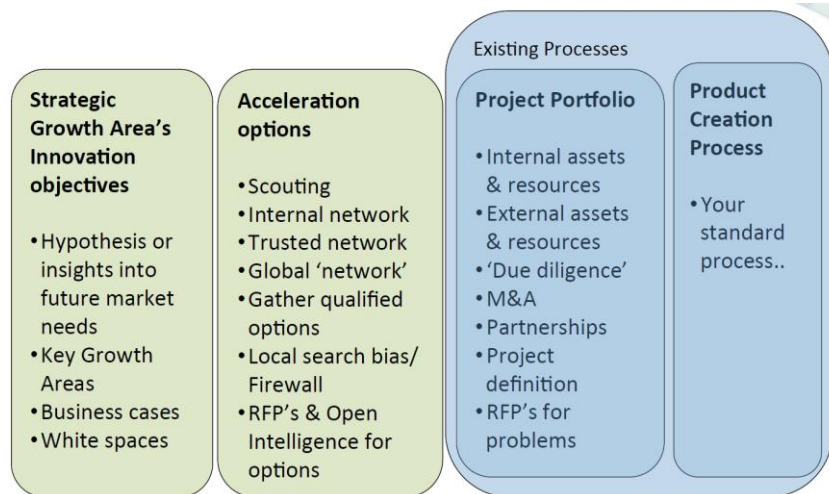
Fig. 13 How Philips adapts and orients towards the future (Wielens 2012)

Furthermore, a widely-used method is the Delphi-method, employing panels of experts to seek their perspectives on current or future scenarios and trends. One of the pioneers for incorporating this technique into daily business was the Canadian division of Bell, in the late 1960s (Sharp 2000). It tried find out the implications and developments of technology and society, that is, trying to understand how society would affect and be affected by their telecommunication products. It delivered very satisfactory results to the company, and as outcome they yielded vast qualitative data to be employed for future planning (Sharp 2000). Other renowned companies that have successfully implemented this tool are IBM, AT&T, TRW, Bharat Heavy Electricals and Goodyear. It is also being very widely used at government-policy level in Europe and America.

b. Participation

For enhancing participation, a number of relevant existing measures are presented. A practical application of how to improve participation of both internal and external stakeholders is found in (Zahinos 2013). This example is especially relevant for this study since it is a case study within the automotive sector, specifically to SEAT.

It consisted of a project of electromobility services, in which software for enhancing responsible use of transport vehicles were couple with opening the innovation process to external stakeholders and even co-creating with potential customers. It is an interesting example, in the sense that it provides a view of the three novel innovation approaches applied in the automotive industry and show a wide range of methods and tools for deploying them in real scenarios, as shown in the Table below.

Table 11 Responsible Innovation implementation tools (Zahinos 2013)

Tools	Aim

Stakeholder mapping	Enhancing participation, at the ideation, evaluation and pre-development stages.
Purposive and convenience sampling	Enhancing participation, throughout innovation process.
Internal-stakeholder workshops	Covering all five dimensions of Responsible Innovation, during the stages of idea generation, evaluation and pre-development.
Multi-stakeholder workshops	Covering all five dimensions of Responsible Innovation, during the stages of idea generation, evaluation and pre-development.
Discussions with internal and external stakeholders	Enhancing anticipation, reflexivity, deliberation and responsiveness throughout innovation process.
Web-based platforms	Enhancing participation, reflexivity and deliberation.
Unstructured interview	Participation, at evaluation and pre-development stages.

To show tools that can be used in order to achieve the aforementioned aims, the tools employed during the workshops, some of the most relevant were: brainstorming, business model canvas, ethnographic profiles and trend analysis. Further tools can be found in (Zahinos 2013). For the ideation stage and involvement stakeholders, there is a wide spectrum of sources and methods. For instance, below is shown the effectiveness and degree of implementation of such tools:
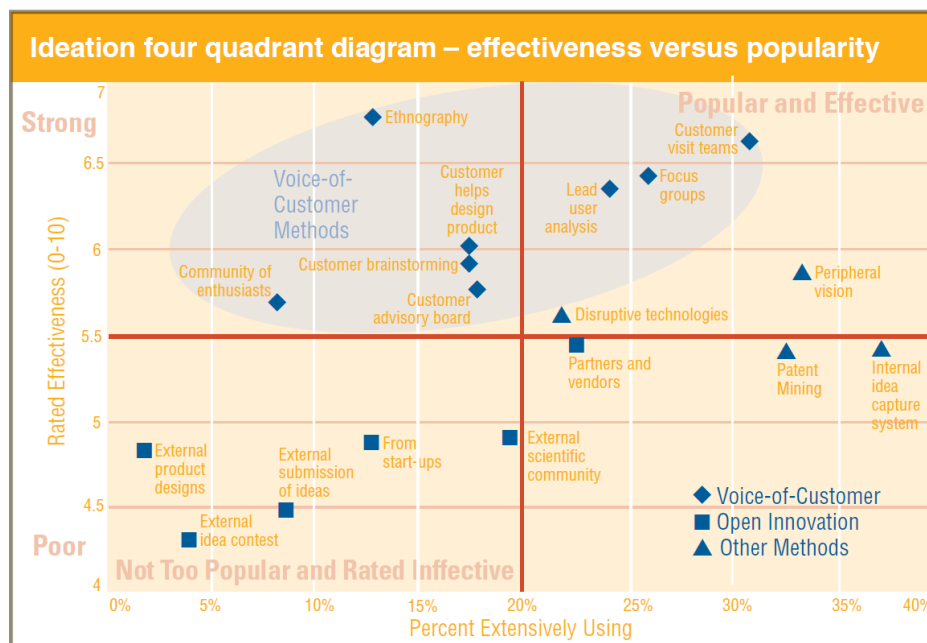
Fig. 14 Advanced ideation methods, rated on effectiveness vs. popularity of use (Cooper 2010)

A precaution has to be noted here. Firstly, this is a perceived (subjective) effectiveness, not necessarily the real (objective) effectiveness. This may also be biased against the novel approaches, be it because they haven't been fully exploited and experienced yet, be it because of resistance to change and novelty.

b.   1. Participation of internal stakeholders

A relevant example is the automotive industry's leader Toyota, which guides its principles through the so-called 'The Toyota way'. One of its main aims is to enhance the engagement of its internal stakeholders and is based on the following pillars:
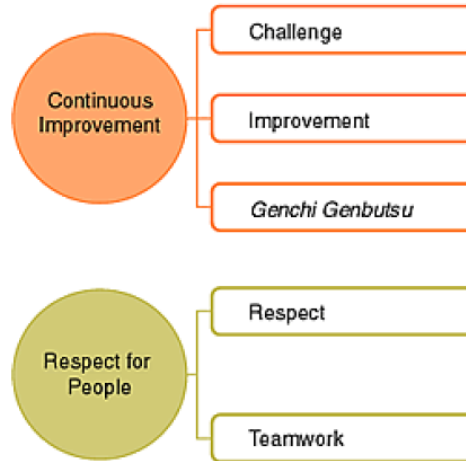

Fig. 15 The pillars of the Toyota Way (Barnhoorn 2012**)**

Expanding on the latter subset ('respect for people'), which is more relevant for the participation dimension, the Toyota Way underlines that company performance and quality can be enhanced by means of enhancement of personal as well as professional growth. In order to achieve this respect and growth, assessment is based on the team's performance rather than on individual basis. This leads to higher compromise and collaborative spirit by the workers (Barnhoorn 2012).

Some other examples within the automotive industry, of enhancing the participation of internal stakeholders, are BMW's 'Virtual Innovation Agency' and Volkswagen's internal innovation marketplace, which allow engineers and technicians to bring into the table product-related new innovative ideas through a global online platform (De Massis 2012, BMW 2013).

Unconventional measures, which target increasing the employees' motivation and engagement, are especially present in the Silicon Valley companies. The most publicly-known is Google's 20% 'open' time, in which the engineers can spend 20% of their working time in projects of their own election, which may well be unrelated to their job position. Not only has increased commitment and drive of employees, but also opened the spectrum of innovation, and delivered notable results such as 'AdSense for Content' or 'Google Suggest' (Rasztovits 2012).

Remarkable is the coupling of Silicon Valley and automotive manufacturers, exemplified by BMW's Technology Office in Palo Alto. Not only do employees enjoy a more entrepreneurial and open setting,

but also job rotations and constant flow of temporarily-relocated engineers from other divisions of the brand, stimulate a higher involvement from internal stakeholders (BMW 2008). Furthermore, they constantly present them with new challenges, and employees can be simultaneously be engaged in as much as six projects, of different degree of maturity. To strengthen this challenging culture, and maintain momentum of creativity, workers also change roles and for instance structure and management are reshuffled every three years.

b. 2. Participation of customers

Understanding and involvement of customers is, as previously explained, being considered increasingly important in the current market environment. In this respect, the Co-creation approach gains significant momentum.

An exemplifying recent case of how Co-creation can improve Responsible Innovation is elaborated in (Ramaswamy 2009). It shows how Spanish bank "Caja Navarra" decided in 2004 to take an innovative turn to its current strategy and seek active involvement of its stakeholders, notably its customers, for increasing sense of loyalty and ownership, as well as bringing new ideas to the company.

This can be classified within the new trend of the so-called "civic banking", by which stakeholders are not only taken into account but also incorporated within the decision-making of the entity. Another remarkable example of this trend in the banking industry is the Dutch Triodos bank (TriodosBank 2013).

It was framed in the form of an initiative called *'You choose: You decide'*, by which customers were encouraged to select among 7 social action programs. This was channeled by means of (online and offline) platforms of customer engagement. One of the vehicles to convey such intent was providing potential customers an online platform by which they could anticipate the benefits and funds devoted to social projects.

This initiative allowed ensuring transparent and responsible innovative banking, engaging a wide range of stakeholders (customers, employees and NGOs) who become co-creators that are socially responsible. (Ramaswamy 2009). In fact it was not a single and isolated initiative, but rather a whole new framework, aimed towards achieving full transparency and accountability in the face of their stakeholders (Ramaswamy 2009).

The benefits of this are not only brand-building but also increasing the participation and engagement of its customers with the society as a whole. Furthermore, not only are external stakeholders more

involved, but also internal stakeholders become more active. Evaluations showed that satisfaction of both customers and employees notoriously increased after the implementation of this initiative (Ramaswamy 2009).

However, this is can still be framed as a mostly conventional type of Responsible Innovation, a sort of co-creating Corporate Social Responsibility, by engaging individual and business customers as well as 'social project partners' (Ramaswamy 2009). In conclusion, the initiative by Caja Navarra is an archetype of how customers can be actively involved in the creative and decision-making processes of a firm, but also opens the door to further deepening of the responsible approach.

A simple example of how Co-creation can be very relevant to the automotive industry can be traced back to the mid-1980s, when a BMW employee decided to privately modify its own compact sedan car into a family tourer. This concept was later taken over and co-developed by BMW, which still nevertheless continued harnessing the input of this worker/customer (BimmerPost 2013). Finally, another example comes from the Polymers division of Bayer. It launched the creative center, in which key customers can intervene since the first phases of the innovation process (Gassmann 2004)

Co-creation platforms and activities

Application of most of these methods can be especially seen in the case of two avant-garde companies in the field of Co-creation: Ducati and Eli Lilly, as shown in (Sawhney 2005).

Applicability to Stage of New Product Development Process

	Front-end (Ideation and Concept)	Back-end (Product Design and Testing)
Deep/ High Richness	Tech Café Advisory programs supported by product engineers Ducati Service Technical Forum & Chat	Design Your Dream Ducati Focalized contest Ducati Garage Challenge Virtual Teams
Broad/ High Reach	Online survey to improve the Website Polls & feedback sessions My Ducati Virtual scenarios	Mass customization of the product Web-based product testing

(Nature of Collaboration)

Fig. 16 Methods employed by Ducati (Sawhney 2005)

Applicability to Stage of New Product Process

	Front-end (Ideation and Concept)	Back-end (Product Design and Testing)
Deep/ High Richness	Specialized customer forums InnoCentive	Advisory programs with selected doctors Supplier Diversity Development
Broad/ High Reach	Online polls & surveys Feedback sessions with patients and doctors Educational programs	Customization of treatments

(Nature of Collaboration)

Fig. 17 Methods employed by Eli Lilly (Sawhney 2005)

Furthermore, some practical examples of these methods within other companies are:

Technology scouting	Procter & Gamble employs technology scouts (80 currently) foe exploring and uncovering new technological opportunities (Viskari 2007)
Online surveys	Ducati carries out extensive online surveys with loyal users or fans (Sawhney 2005)
Online concept labs	In the Volvo Concept Lab, customers can 'explore' future prototypes of the company (Volvo 2003).
Online market intelligence	Similar to the "technology scouting" practice. A notable example is Intelliseek (Businessweek 2013)

Listening in	Web-based virtual advisers (Urban 2004)
Online conjoint analysis	General Motors' AutoChoiceAdvisor tool facilitating users to choose their most suitable vehicle, while at the same time GM gains insightful quantitative statistics on customers' preferences (Sawhney 2005). The MIT developed a cost-effective conjoint analysis platform for companies to use with customers (BusinessDevelopmentDirectives 2008).
Innovation marketplaces	Examples of online innovation marketplaces are HelloBrain.com, Experts-Exchange.com, NineSigma.com and Yet2.com. Large corporations, such as Procter & Gamble, can become part of these online communities (Viskari 2007) (Rasztovits 2012).
Virtual environments	For instance, National Semiconductor offers the online toolkit Webench, an online design environment where circuit designers can virtually design their own circuit prototypes and have it delivered to their location within 2 days. Ducati also encourages users to submit their own designs via an online design tool, and some of the concepts are later incorporated to their products (Sawhney 2005). The Plastics division of General Electric enables customers to account for a significant amount of the development, for instance "a custom resin for a specific application". In order to do so, GE provides them access to a library of compounds and the tools (Prahalad 2002).
Open source	Open source is at first glance difficult to apply to the automotive industry, and is most commonly employed in IT. However, new trends indicate automotive industry will eventually adopt some of the open source practices. For instance, in 2010 Local Motors launched the first-ever open-source designed car, in which online community users developed the car, but unlike a traditional crowdsourcing, the IP was free for others to manufacture their cars, effectively implementing a decentralized manufacturing model. Two years Local Motors later embarked with BMW on developing a Co-creation platform for improving human driving experience (Viskari 2007).
Mass customization	For instance Nike carries out mass customization for its sneakers, via its corporate website (Sawhney 2005)
Beta testing	Now widely used in the software industry, probably the most notable large-

	scale example is the "Google Labs" (Sawhney 2005)
Online product testing	Fiat involved, through its corporate website, over 3,000 users in the design concept tests of its new Punto. (Cambil 1999)
Living labs	Especially used in IT industry, a good example is the Testbed Botnia (Rasztovits 2012).
Crowdsourcing	A notable example is Bombardier's YouCity, which also made extensive use of social networks in order to build a 'sense of community', and is supported by the company's experts. (Bombardier 2012). Another transport industry crowdsourcing example is BMW's innovation community, supported by specialist consultancy Hyve. Procter & Gamble's crowdsourcing platform is renowned for its strong participation, and allows to focus both on specific topics/challenges as well as other out-of-the-box ideas. It also has an internal platform (InnovationNet) for harnessing the potential of all internal stakeholders (Viskari 2007). Through their Itopia website, Intel has created a net of IT professionals that can directly interact with the company's engineers, as well as among themselves. Also Starbucks (*MyStarbucksIdea.com*) and Dell (*IdeaStorm*) run crowdsourcing communities for collectively finding new solutions (BusinessDevelopmentDirectives 2008).

* Definitions and insight on these initiatives can be found in (Sawhney 2005).

While there is a wide range of effective Co-creation methods and many lack of complexity, the transition for implementing Co-creation may not prove straight forward. As (Shaughnessy 2012) claims, it may be more difficult to integrate within large corporation given that pursued innovations have to suit a previously defined roadmap and categories. As a manager of Philips claims: *"the flexibility of the crowd is still a clash for us. There's a limit to the flexibility you want to create"* (Shaughnessy 2012).

For achieving the cultural shift, companies such as Philips and Nokia have to overcome the threat of not-invented-here syndrome, which can be a barrier for opening the organization and looking outside for solutions (Shaughnessy 2012).

b.3. Participation of other external stakeholders

The measures for improving interaction with external stakeholders are presented here. It has to be remarked that special emphasis is placed on how Open Innovation can enhance participation of external stakeholders.

But firstly, it is interesting to state that the 'respect' component of the aforementioned 'Toyota way' does not only concern internal stakeholders, but also external. It aims to create bidirectional trust with business partners, and challenges for continuous improvement as well as providing them support, in order to achieve the kaizen principles (Barnhoorn 2012).

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To enhance trust and collaborative climate from external partners, and in turn increase their engagement, IBM displays keenness on demonstrating methodologies and prototypes (Viskari 2007).

This 'opening' to external stakeholders can also be carried out by means of a more informal network, as BMW does in its California´s base (BMW 2008), which nevertheless engages in workshops with cross-industry actors. For instance, they keep close contact with neighbouring prestigious universities, namely Berkeley and Stanford, which are also a source of talent recruitment.

Modes of collaboration with external partners

Notable Open Innovation's best-in-class companies are shown in the figure below, pointing out the types of Open Innovation strategies they especially focus on:

Table 12 Favored modes of Open Innovation partnership per company (Viskari 2007, De Massis 2012)

Firm	Innovation push / open business models			Innovation pull / exploratory research		
	Licensing	Open source	Collaborations, spin-offs, Venture capital	Innovation networks	Strategic alliances, joint ventures	Acquisitions
Cisco					X	X
DuPont	X					
IBM	X	X		X		
Intel			X	X		
Lucent			X			
P&G				X		
Philips	X		X		X	
Sun		X				

Italian car manufacturer*	X		X	X	X	
Pininfarina				X	X	
Bosch			X		X	

Unnamed due to confidentiality issues

Philips is especially keen on cooperating via joint ventures, as opposed to other 'modes' of collaboration (Tidd 2005). General Motors devotes as much as 25% of its overall R&D expenditure of initiatives of this kind (Wielens 2012). Procter & Gamble establishes the 'Joint Technology Developments' for partnering with other firms, and also the 'Critical supplier Partnerships' program.

It is important to remark that these types of strategies or partnerships should be limited to partnering up with other players of the industry, but should strongly consider firms from other industries too, as according to (Gassmann 2004) they can provide a significant impulse to the aim of accessing new technologies.

For outbound Open Innovation, an internal venture can prove effective, as Lucent did with its New Venture Group (NVG), a combination of corporate venture and venture capital. Employees can launch their initiatives, and are strongly backed, by a flexible funding scheme and easiness to return to previous position if the initiative fails. While it provides all sorts of resources and backing, it still allows the initiators freedom to choose the business approach (Viskari 2007). All this, in turn, enhances risk-taking and entrepreneurial culture across the organization.

Similarly, as Philips actively puts into practice, internal incubators are a powerful tool for outbounding ideas with potential, by means of a protected space that can provide financial support, facilities, advice on business planning as well as networking with potential partners or even other start-ups (Philips 2005). Furthermore, they lunched the 'High Tech Campus', where around a century of external firms are hosted, for allowing a fast flow of outbound (and inbound) knowledge (Wielens 2012). The pioneer of this philosophy was Procter & Gamble, by establishing 'extended networks of inventors' (Shaughnessy 2012). Likewise, IBM established in Zurich Rüschlikon a 'solution lab', that strengthens relations and partnerships with universities and companies, carrying out activities such as seminars and conferences (Viskari 2007).

To enhance the licensing network, a suggested approach is that of Solvay, which stimulates collaboration cross-licensees, sharing their common knowledge with Solvay and the other members, which also allowed Solvay to be in command of the process (Viskari 2007).

IP can also be 'traded' via an IP (or innovation) marketplace. For instance, DuPont's Technology Bank, where DuPont can in-license and out-license technology (Viskari 2007).

Procter & Gamble opted for licensing the full range of its technologies at maximum five year after patenting or three years after market introduction (Sakkab 2003, Procter&Gamble 2006). Furthermore, firms such as DuPont or P&G even consider donating some of its IP to universities and NGOs, for improving public image and tax benefits (Viskari 2007).

Likewise, Philips is found to act proactively in terms of out-licensing patents instead of retaining them (unused) for the sake of defending against competitors (Viskari 2007). IBM goes one step further and also out-licenses trade secrets and know-how. In order to channel this, they use multiple modes: joint ventures, joint development alliances, out-licensing with increasing royalties, all coordinated through its "Ventures in Collaboration". It especially targets SMEs and entrepreneurs; further details of this program can be found at (Viskari 2007).

Alternatively, open source may be more suitable in certain cases, especially for software-related activities. This can prove especially adequate for achieving a head start or even lock-in of its own technology against rivals, as it can engage a large number of contributors that sped up the development and also increase customer base, while keeping the development costs low. To still harness financial benefits, a key concern arising from Open Source, IBM derives added services and applications which it can still sell (TheEconomist 2005, Viskari 2007). A similar philosophy is followed by Sun Microsystems (Viskari 2007).

Sometimes the know-how may be better gained by means of direct acquisition of the entire organization, rather than the patents. Again, this practice seems to be especially present in the ICT and software industry, with the notable examples of Google and Cisco. The former acquires start-ups in order to incorporate both know-how and talent, and considers them (the team or organization that generated the innovation) as the most suited for also further develop it, and enhances the knowledge spreading across Google. An example of this is the app Google Voice or even Youtube (Rasztovits 2012). Cisco considers acquisitions as the most suitable form for incorporating scarce IP and know-

how, and defines three criteria or aims for giving them greenlight: retaining employees, supplementing New Product Development and increasing Return on Investment (Stanford 2004). This is supported by tools such as the 'scenario planning approach'.

For implementing the above mentioned processes, an alternative to propelling them internally, which can be hindered by lack of previous expertise, companies such as DuPont gather assistance from external partners such as 'conventional' consultancy firms or online firms (Viskari 2007).

The selection of whom to partner which, and not just 'how' can deliver differing results. For instance, some projects may be suitable for the large corporations to partner with smaller and young firms. This can allow combining the benefits each offer (i.e. flexibility of small firms with financial strength of large ones) and lead to decreased time-to-market, especially for product's radical innovations (De Massis 2012). This is similar to what Company B of our research showed.

Nonetheless, implementing Open Innovation may prove challenging. Dutch firm Philips is one of the most renowned companies for successful Open Innovation deployment (Shaughnessy 2012), and had a highly relevant transition process. According to (Wielens 2012), a main contributor for their renowned implementation of Open Innovation embedding the Open Innovation approach within the company's culture by involving all employees. In fact the key necessary capabilities for their success in the implementation of Open Innovation were:

- Internal and external stakeholder's engagement
- Acting empathically, with other stakeholders, and therefore recruiting employees with that skill
- Workers with networking abilities and challenge-seekers, communicative and open-minded. This workers are encouraged to freely establish external contacts

Overall, it is considered that the most critical value for this transition's success is establishing 'trust' (among Open Innovation partners) (Wielens 2012).

It is critical to communicate these challenges, in order to quickly increase the awareness and sped-up the transition towards fully Open Innovation. For instance, it devotes extensive part of its annual report to Open Innovation, and even one issue of its internal magazine (Viskari 2007).

For carrying the transition from traditional closed innovation to Open Innovation the company took a number of actions. Firstly, the firm teamed up with intermediary agents (i.e. Ninesigma) for taking a bottom-up approach and learn from the Open Innovation's first iteration process. Afterwards, top

management, in this case the CTO of a major business unit, engaged in propelling the implementation. This was followed by a 'sector-wide program', involving over two thousand employees, which provided specific training to achieve the cultural corporate change. Finally, this is reinforced by continuously endorsing one or more 'Open Innovation' champions / ambassadors per division and at different levels of the hierarchy (Wielens 2012). This transition strategy was basically supported by three main pillars, namely: opening and engaging with external partners, consumer-centric approach and haste of development and reaction (Wielens 2012).

Finally, it has to be accounted that the transition process is neither easy nor fast, and requires continuous improvement. For instance, Philips is nowadays still implementing new improvement measures, by for example aiming towards further increasing development speed through the use of a "block buster accelerate team" (Wielens 2012).

c. Deliberation

This include methods which support the decision-making activities and that react to the interactions with stakeholders. For instance, General Electric uses its 'Business Screen', a form of portfolio analysis comparing industry sector attractiveness with the competitive position (Himanshu 2013). However, the most commonly used portfolio approach is the Boston Consulting Group matrix, launched in 1973, that compares market growth with market share, and gives four categories, as shown in the Figure below.

Fig. 18 Boston Consulting Group matrix (Himanshu 2013)

Other methodologies found in the industry, which enhance the deliberation, as well as reflectivity and responsiveness processes, are: cost-benefit analysis (CBA), scoring models, expert evaluation, workshops, customer forums, online surveys and Advisory programs supported by R&D and marketing staff (Eversheim 2009).

d. Responsiveness

Responsiveness in practice applies especially to companies reacting to the customers' evolving needs and the societal changes. With regard to adjusting to customer needs, a methodology that was used by some leading companies was the SERVQUAL, developed by Raja Parasunaman, which allows to assess the gap between customers' expectations and the performance delivered by the product, therefore allowing companies to respond and interact to reduce those gaps (Zeithaml 1990).

Or for instance, it was found throughout the web search that many of the above-average performing companies have a well-defined process for rapidly reacting to the customers' perceptions or impressions. That is, not only once the product is launched (i.e. to make a repair call of all possible defective products) but also still within the innovation itself. The leading companies try to incorporate and respond to the voice-of-customer as early as possible within their innovation process. For instance, by the co-creation practices mentioned in the previous sections.

e. Reflexivity

This again is closely interlinked with practices previously shown. So for instance, how society reacts to new disruptive products that affect the societal trends, and how companies are affected by this. In order to monitor that close cause-effect link, some companies were found to make use of social scientists, to better understand the relations between the different social and technical factors. In this way they are able to anticipate the effects of these correlations, which leads to them starting the development of new products that fit to this (BMW 2008).

Chapter Conclusions

It was found in the extensive review of scientific literature and website/corporate data that already a number of pioneer companies have adopted a significant amount of practices that go in line with the majority of dimensions from Responsible Innovation. They try to anticipate the bi-directional implications of the society-product relation by means of a wide range of methods, they try to stimulate

higher participation of internal stakeholders by means of initiatives that make the company culture more open and entrepreneurial, they enhance the deliberation processes and also the analysis of the reflexivity, as well as increasing the responsiveness to the occurring events and changes.

Chapter Summary

In this chapter a synopsis of the identified practices at firm level towards supporting the Responsible Innovation approach is carried out. These practices were structured following the configuration of the framework of analysis, that is by the five R.I. dimensions and themselves also sub-divided in variables. The practices were sampled from companies of different industries, which were renowned for excelling in certain aspects. For instance, Procter & Gamble for being a pioneering in Open Innovation, or Google for being well-known for enhancing participation of internal stakeholders by means of 'unconventional' methods.

Chapter 5. Empirical research and results

5.1. Introduction

Bearing in mind the structure set by the framework of analysis, the empirical research was carried out following the methodology explained in Chapter 2. Firstly, the case study is explained and thereafter the results from the research are presented.

This case study elaborates on the context of the studied firm, both at industry and firm level, and its specific problematics concerning the innovation process. This is done in order to provide an understanding of why this case study was necessary and which adaptations the benchmarking conclusions needed.

The results, that is best-practices deducted from the primary research data collection, are elaborated, based on the key arguments from the semi-structured interviews and the survey carried out with the benchmarking partners. Therefore, for presenting the results questionnaire analysis and quotations from managers are interlaced, following a logical argumentation flow, but at the same time ranking the relevant results upon which responsible innovation dimension and variables they belong to. This analysis is presented following the same categories and dimensions used in 'Chapter 4: "Better" practices identified from the literature', in order to give coherence as well as allowing easier comparability and interlacing of the identified practices, so that the final framework can be easily built in 'Chapter 6. Best-practices framework'.

It is important to note that, given the small size of the sample and the study's scope, the survey results are not intended to have complex and sound statistical analysis. Instead, it was aimed at merely point out general trends and backing the analysis extracted from the semi-structured interviews.

The primary data analyzed is extracted from the selected company's interviewed, which are enlisted below only by industry or main business sector, guaranteeing the previously-agreed confidentiality. The companies selected were leaders or better-than-average performers, among a range of industries with strong R&D intensity, such as automotive, IT equipment, aerospace, chemical and aerospace. In total, the companies interviewed were 7. It has to be noted that from the automotive company multiple divisions were analyzed, given higher proximity to the context of SEAT as well as higher access to direct contacts. For similar reasons, two companies from the aerospace sector were studied.

Table 13 Benchmarking partners' list

Company code	Industry
Company A	Automotive
Company B	IT equipment
Company C	Consumer electronics
Company D	Aerospace
Company E	Aerospace
Company F	ICT
Company G	Chemical

Nevertheless, an important reminder has to be issued: the results here are nonetheless deriving from 'perceived' states, not from 'purely objectifiable' realities. That is, a certain manager may believe that a certain situation is happening within its company, while other workers may not see it in that way, and furthermore, it can even the case that both of their perceptions are not the 'pure reality'. Therefore the results shown here are only perceptions of the on-going practices. Nevertheless, the researchers of this study have tried to mitigate this perception bias, by means of direct observation and triangulation from third-party sources.

5.2. Case study: The SEAT case

This thesis focuses on the case of Spanish car manufacturer SEAT as it is framed within the Fostering Innovation in SEAT (FIS) project, and specifically focuses on the innovation benchmarking component of this project. The FIS was launched for addressing the current innovation flaws exiting at the Spanish OEM and trying to enhance its responsibility, by carrying out a wide-range analysis and action plan. Its objectives are:

Aiming to define and implement both a strategy as a process of innovation in order to improve SEAT innovation performance. The FIS is a fifteen-month project with the following sub-objectives:

- To develop a diagnostic of the SEAT current innovation system and process
- To define an innovation strategy based on SEAT specific context and its overall objectives
- To propose and implement changes in the current innovation process based on the SEAT innovation diagnostic and leading companies' best-practices from both the automotive industry as other high-tech, mature industries
- To define and implement a change management plan that facilitates the adoption and institutionalization of both the strategy as the process of innovation

The context of SEAT and its status quo has been extensively analyzed in (Zahinos 2012), while the general automotive industry is a widely addressed topic (ReportLinker , Irandoust 1999, Ili 2010, Köhler 2011, Barnhoorn 2012). Therefore, in the coming sections, the context and background of the automotive industry and the specific case of SEAT will be detailed.

5.2.1. Car industry context

The current socio-economic environment, with Globalization and ever-increasing number of 'players', is placing mounting pressure on companies. These factors are demanding *"a faster, customer-centric, and Responsible Innovation process"*. This implies a continuous stream of innovations, and new forms to generate it. Increasing demands by customers and higher connection generates both risks and opportunities, with internet being the highest exponent of this double-side sword. One key implication is that now customers are more willing to engage as participants of the development for value creation (Prahalad 2002).

Specifically to car manufacturers, there are a number of aspects that adding pressure for innovation, such as *"the shorter innovation cycle time, the increasing product complexity, the downward cost pressure combined with increasing demands for performance and quality"* (De Massis 2012). Other factors are:

Table 14 Factors affecting the automotive manufacturers (Delbridge 1995, Barnhoorn 2012, Bratzel 2012)

External environment	Internal environment
• Highly competitive industry	• Highly hierarchical and bureaucratic structure
• Large players	
• High regulatory pressure	• Highly complex product
• High pressure from consumers	• Medium-high R&D intensity
• Large dependency on suppliers	• Low Return on Investment
• Low growth rate of automotive industry	

5.2.2. The context of SEAT

SEAT is a Barcelona-based car manufacturer, founded in 1950, and is currently the only Spanish automotive OEM able to carry out the entire car production process, from the first stages of design to the final manufacturing. Currently embedded within the Volkswagen Group, SEAT is heavily benefiting

from the technologies developed by its parent company and the economies of scale, but it also poses challenges on managing sufficient freedom for taking its own initiatives and innovations.

Competitive disadvantage regarding innovation culture was diagnosed at earlier stages of the FIS project. The problems detected in SEAT span across the full extent of the innovation processes. The starting point is that there is no established specific definition of innovation; furthermore Volkswagen does have a definition, but is colliding with the concept of innovation SEAT follow in practice. Volkswagen defines product innovation as *"a novel solution that offers a significantly increasing and visible benefit to the customer through improved and additional services and functions. This change in the customer value allows a significant differentiation from competitors. Thereby special attention must be given to the establishment of unique selling propositions (USP). Moreover, innovations are to increase value of the company stakeholders, customers, employees, investors and society"* (Zahinos 2012).

However, in the SEAT firm, the diagnosis carried out to the date showed a widely different definition of product innovation, depending upon the department and even the individual, showing a lack of unified methodology and consensus. Moreover, SEAT does not have a well-defined process of innovation and unified procedure for addressing and managing product innovations. Each department follows different approaches, and coordination in this respect is far from smooth or on a regular basis.

Some further barriers were found. As is the general pattern across cars manufacturers, SEAT is characterized by a highly hierarchical setting, with a complex matrix structure and top-bottom decision making. As well, the national culture and context, with Spain struggling not only with financial conditions but also productivity and creativity-facilitation levels as well as rather bureaucratic relationships (Morgan 2005), may also play a significant role in the lagging of adequate innovation system. This enhances difficulties in changing the pre-established mental models, and therefore of reverting the low innovation culture status quo. Furthermore, for instance, it was detected during the diagnosis phase that the R&D department focused mostly on problem-solving and incremental innovations, but rarely on radical innovations, which noticeably limits its possibilities towards reaching full innovation potential performance. Finally, but not least importantly, the firm is experiencing, due to the economic downturn and specific financial losses, a decrease in its R&D budget.

Therefore, there is a need to overcome those barriers at the multiple unit levels (among individuals, departments, multi-department, etc.). In order to have guidelines for determining towards which

direction to work for curing the previously mentioned problems, a suitable solution is to carry an external benchmarking, looking not only within direct competition, but also into other comparable industries.

However, SEAT has not developed nor deployed, to the date, any knowledge-oriented benchmarking. So far, the only forms of benchmarking used within the firm as the so-called technical-oriented benchmarking, that is, benchmarking of production processes (i.e. to measure factory processes efficiency) and benchmarking of product performance (i.e. measuring of the vehicle's performance in respect to other automotive manufacturers).

The external business environment of SEAT can be summarized as:

Table 15 Factors affecting SEAT specifically (Bratzel 2012, Zahinos 2012)

External environment	Internal environment
• Spanish/South Europe market strong dependence • Significant dependence on governmental subsidies for the programs with external stakeholders	• Highly hierarchical and bureaucratic structure • Fuzzily defined innovation process • Dual working culture. National (working) cultures (Spanish and German) • Financial struggles • High dependency on parent company (VW Group) • Traditional working approach • Limited integration of active 'voice of customer' • Low risk-taking culture

On the other hand, zooming into the innovation process, *"within the last decade, SEAT has been able to internally propel, and implement in its vehicles, a limited number of strategic and competitive innovations. That circumstance makes it necessary to revise and update the innovation process, so as to capitalize on resources and capabilities available within and outside the company and thus, enhance its overall innovation performance"* (Zahinos 2012).

Further key aspects regarding the innovation process that were diagnosed are:

Table 16 Factors affecting SEAT's innovation process (Zahinos 2012)

• Unclear process for idea generation, lack of systematic methodology (i.e. creativity-	• Weak cross-functional approach for innovation • 'Shooting ideas' culture

enhancing tools)	• Weak use of innovation portfolio methodology
• High flow of innovations from parent company (VW Group)	• Weak 'resource allocation assessment'
• Innovation decision-making 'sometimes' done through cross-functional committees (not teams)	• "low cooperation, communication and risk-sharing among groups brands for the first stages of innovation process"
• Limited involvement of broad internal stakeholders/individuals	• Low degree of collaboration with universities and institutes for innovation
• Limited systematization of innovation's knowledge management	
• Lack of platform for idea generation	

Finally, further contextual analysis can be found in the Appendix SWOT analysis.

5.2. "Better" practices identified from the empirical research

Hereby the results of the empirical research are presented.

a. Anticipation

The practices here can be framed as the main component of the so-called 'Future orientation', a sort of 'stage 0', the foundations needed prior to engaging in an innovation process.

a.1. Opportunity identification and opportunity prioritization

Future orientation, and therefore opportunity identification, implies, above all, adapting the company's approach to the future trends. Furthermore, it aims at identifying new technological and/or market opportunities. This is intended to be measured by Survey Question 1.2.

Which future-oriented methods does your company use for opportunity identification?

Answer	Number	Percentage	
Delphi method (*)	2	29%	
Foresight / anticipation (*)	5	71%	
Scenario analysis (*)	6	86%	
Portfolio analysis (*)	6	86%	
Mega-trends (*)	6	86%	
Others (specify)	0	0%	

Average: 3.6 ± 5.2
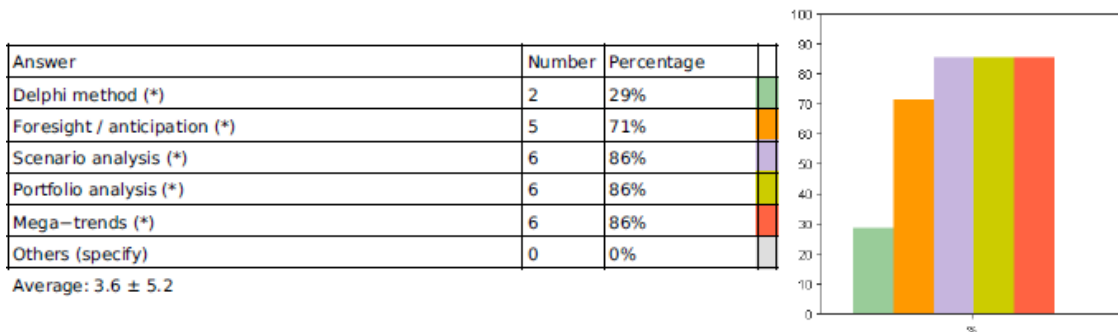
Fig. 19 Survey results: Future-oriented methods

As shown here, and reinforced during our interviews, companies make especially use of well-known managerial tools such as portfolio or scenario analysis, as well as future exploration techniques as megatrends and also mega-trends.

For instance, in Company B, once the future trends have been identified, a roadmap is delineated, in which firstly a business plan is defined, then strategy elaborated and then innovation portfolio evaluated. In other to identify the trends, it talks with experts from other fields such as architects (to understand common trends) or science-fiction writers (to make scenario analysis). Company E carries out market historical analysis and interviews with potential clients in order to be able to detect the future trends and desired evolution from customers.

Opening the organization to provide deeper perspectives from the socio-technical environment, and accessing to external and existing knowledge can save inefficient 'repeating what is already done' efforts, and can allow to detect and anticipate future trends. This is intended to be measured by Survey Question 1.3.

Your company runs online market intelligence for monitoring customer trends...

Answer	Number	Percentage	
Directly	3	43%	
Outsourced (i.e. via a market research agency)	3	43%	
Does not use	1	14%	

Average: 1.7 ± 0.8
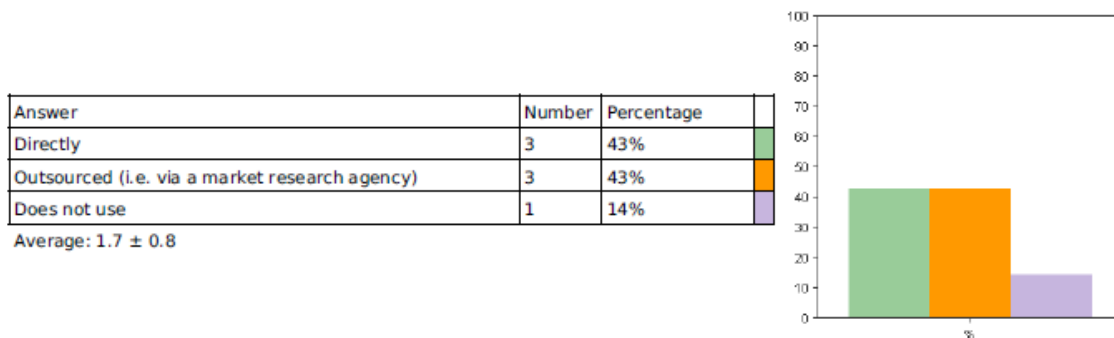
Fig. 20 Survey results: online market intelligence implementation

In this case, there seemed to be a divided approach, which is suspected to be caused by the stage or degree of implementation of active external seeking and opening the organization. This seems to be consistent with what was pointed out in (Wielens 2012), that is, companies which have a long established tradition of novel approaches, have nowadays incorporated this 'external seeking' tools, which those companies at an earlier stage of adoption of the novel innovation approaches prefer to run them indirectly, due to the still limited knowledge they have. It is predictable that once they increase their learning, they will eventually incorporate them internally.

For instance, one division of Company A, that especially focuses on advanced and long-term research, used to employ internal scouts, reviewing magazines and suppliers' information for

anticipating trends, but has nowadays opted for outsourcing this via a start-up, which for instance analyzes around 10,000 news and trims it down to barely 100 key news.

a.2. Communication of the future and strategic orientation

The strategic direction and future orientation not only has to be initially defined by top management, it also needs to flow lower down in the hierarchy, engaging multiple internal stakeholders, especially those from the R&D and Marketing departments (Cooper 1993). In order to do so, it is important to establish an effective engagement communication system, ideally using multiple channels. This is intended to be measured by Survey Question 1.1.

"Which activities does your management use for communicating the innovation's strategic challenges?"

Answer	Number	Percentage	
Regular meetings	4	57%	
Workshops	7	100%	
Corporate statements	5	71%	
Newsletter	3	43%	
Others (specify)	2	29%	

Average: 3.0 ± 3.7
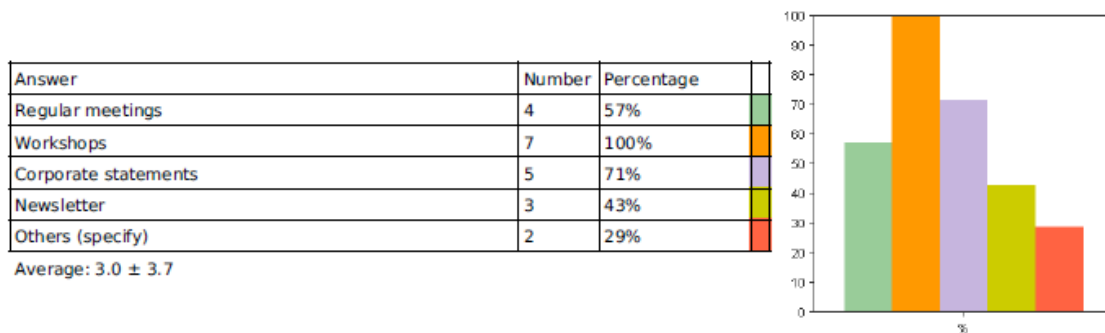
Fig. 21 Survey results: Communication activities

For instance, Company B suggests following unconventional approaches for communicating the innovation challenges. It means conveying new types of messages, from new sources/communicators and through unconventional. It has to be made special, surprising. For example, they involve external members for delivering inspirational speeches (with the assistance of external communication experts). Company A and Company G also make use of speeches, but mostly delivered by internal members, especially top manager, in order to spread the anticipated challenges. This is carried out in the form of workshops, which are also broadcasted via internet website.

Other tools that Company B uses are: short inspirational videos, specific-topic workshops, newsletter developed by design specialists in an unconventional way, and taking the staff out of the building or even to different location for communication sessions.

b. Participation

b.1. Participation of all stakeholders

Having a wider spectrum of sources for idea generation and enrich the process, having the potential of increasing quantity and quality of ideas. After all, this is a key pillar over which Open Innovation approach, and currently seems to be an unstoppable trend towards which companies will sooner or later migrate. This is intended to be measured by Survey Question 2.1.

For your company, how effective are the following sources of ideas...?

Source	Rating: Average and Deviation
R&D staff	Average: 8.3 ± 1.0
Commercial staff (Marketing, Sales, etc)	Average: 6.7 ± 1.8
Staff from Manufacturing, Purchasing and other departments	Average: 5.1 ± 1.9
Parent company	Average: 6.3 ± 2.5
Competitors	Average: 5.9 ± 2.3
Customer or user	Average: 6.9 ± 2.0
Crowdsourcing (groups or communities of users and/or experts)	Average: 6.0 ± 2.2
Suppliers	Average: 6.3 ± 1.8
Consultants	Average: 4.5 ± 1.5
Universities/Public research organizations	Average: 6.3 ± 2.1
Private research institutes	Average: 6.3 ± 2.1
Regulatory bodies (i.e. Environmental standards)	Average: 4.0 ± 0.7
Start−ups	Average: 5.5 ± 2.3
Companies working in other industries	Average: 4.5 ± 1.6
Incubators	Average: 5.0 ± 2.3

Fig. 22 Survey results: Sources of ideas and their effectiveness

It was found that companies still favour their internal knowledge, rating R&D staff as the most effective and used source of innovations. This may be cause both due to the higher easiness of gathering the benefits from inside and technical expertise, as well as due to the fact that Open Innovation is still a paradigm far from fully implemented within the industry, even for the most advanced companies.

On the other hand, other companies and start-ups / incubators, as well as other external sources such as regulatory bodies and consultants, are rated as the most ineffective, which may well respond to the same argumentation of the previous paragraph.

b.2. Participation of internal stakeholders

How can the involvement of all the internal stakeholders, and not just top management, be increased? The aim of this is two-fold: to enrich the ideas' quantity and quality, and secondly to be more democratic process, more participatory and transparent, and therefore more responsible. This is intended to be measured by Survey Question 2.2.

Which processes are used for involving internal stakeholders in the idea generation process?

Answer	Number	Percentage	
Workshops	7	100%	
Regular meetings	6	86%	
Brainstorming sessions	7	100%	
Web−based forum / intranet	5	71%	
Incentive−based programs	2	29%	
Ideas contests	5	71%	
Idea generation clubs	1	14%	
Crowdsourcing	3	43%	
Clinics	1	14%	
Ideation marathon	1	14%	
Others (specify)	1	14%	
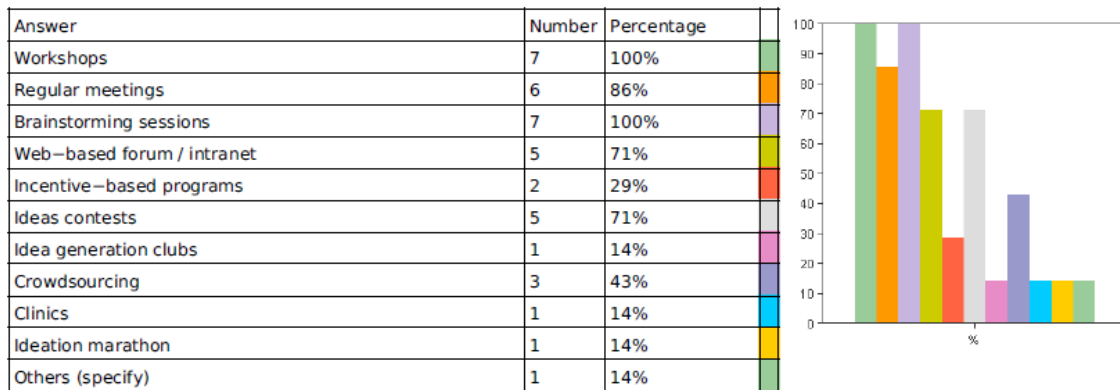
Fig. 23 Survey results: Internal stakeholders' involvement processes

'Traditional' processes are still the highest adopted, namely workshops, meetings and brainstorming. However, it was also noted from the interviews that companies are aware of the existence of other emerging methods, and are becoming more prone to adopt them. For example all those based on online platforms.

In fact, it can be stated that all of the studied companies have an internal IT platform, which facilitates the participation of internal stakeholders throughout the innovation process, most notably for the idea generation phase. Many of them extended this to the evaluation phase too, by allowing voting and commenting of ideas, effectively 'democratizing' the generation and evaluation process.

Additionally, Company B makes use of an Innovation team, in which every year the staff composition rotates, with the aim to engage as many workers as possible, get constant flow of fresh ideas and bring new energy. Participation of as many internal stakeholders as possible is heavily emphasized. It is claimed that with this deployed system, that has an overall cycle of 4 to 5 years, around 40% of the overall's organization workers are involved at one point, spreading the innovation culture and increasing enthusiasm and idea generation effectiveness.

Furthermore, companies can increase engagement by means of capability-enhancing training. For instance, Company D grants a MBA in joint collaboration with a highly-reputed business school to excelling employees, in which participants have to develop and coordinate a real innovation project

with the company. This allows them to have a more holistic perspective of both the company and its innovation process, as well as stimulating employees to perform better in order to have access to such knowledge-enriching initiatives.

Not only the mechanisms and methodologies are relevant, but also how this are supported by means of motivation. Motivation can be inherent from the individual, but it can also be externally enhanced, by use of incentives and rewards provided by the company. This is intended to be measured by Survey Question 2.4.

What incentives and rewards are provided to idea generation's team members?

Incentive	Never	Sometimes	Always
Project−based profit−sharing	83%	17%	0%
Compensation time	57%	43%	0%
Recognition in organization newsletters	0%	83%	17%
Recognition at award dinners	0%	83%	17%
Plaques, pins, project photographs	14%	29%	57%
Project completion celebration lunches/dinners	20%	20%	60%
Non−financial rewards chosen by the team (i.e. trips, family dinners)	40%	40%	20%
Other financial rewards	100%	0%	0%
Other non−financial rewards	86%	14%	0%

Fig. 24 Survey results: Incentives and rewards for internal stakeholders

For instance, Company B provides explicit recognition to the idea submitters, via events and other non-financial mechanisms, is considered an effective stimulus. In fact, one of the company managers argued that this system has shown significant results, by means of intrinsic motivation (proclaiming the motto "innovation is fun"), while monetary rewards have failed to do so and had to be discarded. Instead recognition and explicit management support, immaterial rewarding, is stated to be far more effective. Similarly applies to Company A, and it was felt as a perception in general among all companies to at least some extent. However, to keep this ongoing motivation, they should not stand still, and instead 'push' and introduce new elements, new activities and involve new people to constantly keep the 'novelty' factor. One example of this is the final yearly ceremony, by which they show explicit recognition to the key innovators, and each year they carry it out in a different, surprising manner.

Furthermore, Company B and Company G increase engagement and 'thinking out of the box' by means of informal gatherings, getting employees out of their usual context. For instance, one of them

had held an event called "Beerstorming", a short of informal brainstorming in which employees interact while in a relaxed setting. Managers claim that this sort of activities has really increased engagement of employees.

A powerful tool for enhancing internal participation is the so-called 'Innovation marketplaces', a platform for 'trading', idea generation and evaluation. For instance, Company A managed to involve around 300 employees within this activity in its first iteration. Also engaging internal stakeholders can be applied as means of gathering voice-of-customer; for this, one of the companies had a pool/list of around 3,000 employees who would be keen on evaluating prototypes or idea concepts, as if they were customers.

Company B, Company C and Company G also incubate ideas, injecting investment into them to nurture and further develop their ideas. This is for instance done by means of intra start-up company. Managers of the company claim that the problem they face is not actually related to financial issues, but instead to time; that is to assess the adequate time necessary for proper development, to be sufficiently 'patient'. Company A also provides seed capital, normally to those successful ideas originated in the Innovation marketplace.

Participation of leaders and enthusiasts.

In most cases, the ideas or innovations need to be pushed forward, by formal or informal leaders. While more and more, 'democratic' and consensus-based approaches are favoured, there will always be the need to exist the figure of leader or coordinator, preferably a person that inspires the team. However, not always is it clear which is the most suitable person or role to do so, and can widely vary from organization to organization, and even from department to department. This is intended to be measured by Survey Question 8.1.

Who is usually the leader of the innovative projects?

Answer	Number	Percentage	
Innovation champions (*)	2	29%	
Process/problem owners	1	14%	
Project managers	4	57%	
No one	0	0%	
Other (specify)	0	0%	

Average: 2.3 ± 1.0
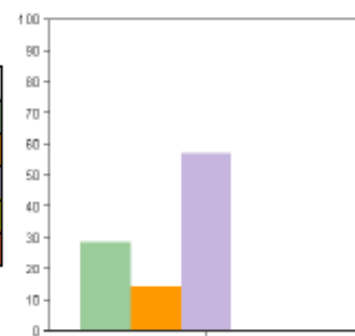
Fig. 25 Survey results: Leaders of the innovative projects

As well as by Survey Question 8.2.

How are these leaders determined?

Answer	Number	Percentage	
Management appoints the leader	5	71%	
A person volunteers	1	14%	
Team members choose the leader	0	0%	
Peers choose the leader	0	0%	
Other (specify)	1	14%	

Average: 1.7 ± 1.5
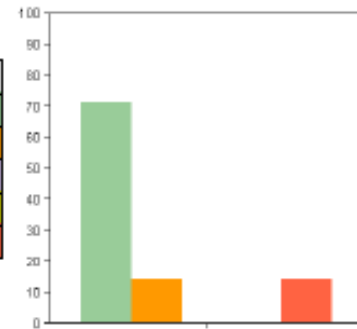
Fig. 26 Survey results: How the leaders are determined

But, how are these leaders emerging? This is intended to be measured by Survey Question 8.3.

Which of the following best describes how the innovations are lead throughout the innovation process (from idea generation to innovation commercialization)?

Answer	Number	Percentage	
Single leader throughout all process	0	0%	
Firstly an informal leader emerges (i.e. idea generator or idea champion), then a manager is appointed as formal leader to lead until the final	4	57%	
Leader changes multiple times throughout the process	3	43%	
Other (specify)	0	0%	

Average: 2.4 ± 0.5
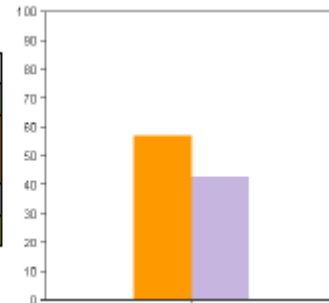
Fig. 27 Survey results: Leadership evolution throughout the innovation process

The leader of the innovation/product project may not always be the immediate superior, but can be simply an enthusiast of the idea. This figure is usually referred to as idea champion or innovation champion. However, given this type of leader was not initially based on hierarchical status, it may need special empowerment and support to allow for solid and successful raiding of the team. This may be done by 'awarding' him/her some form of formal power. Some companies opt for this formalization of 'power', while others may well not feel the need to do so. This is intended to be measured by Survey Question 6.2.

Does your company make a formalization of the 'idea champion' figure/role?

Answer	Number	Percentage	
Yes	5	71%	
No	2	29%	

Average: 1.3 ± 0.5
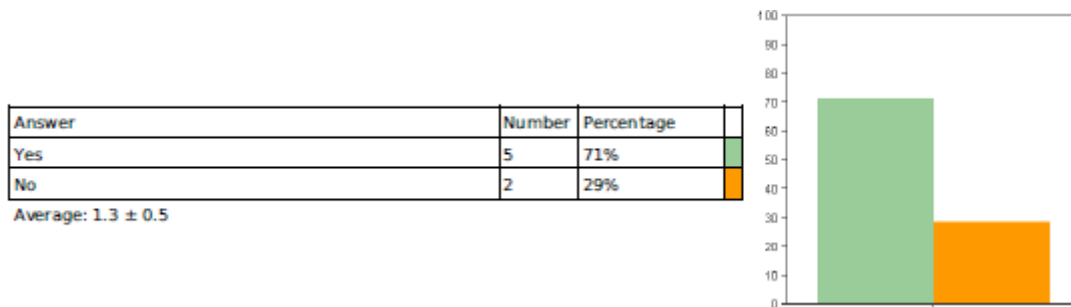
Fig. 28 Survey results: Formalization of innovation champions

It is worth remarking that while 'innovation champions' may not always be considered as the formal leader of the innovation process, they are present in all the companies studied. Company C and Company G make a very strong formalization of the innovation champion. They even had a 'Open Innovation' champion or leader (to be explained in more detail in the coming section on external stakeholders).

However, a couple of companies still opted for an informal role. Or some others give it a different name. For instance, Company D and Company E have a similar role, named as 'integrators', which are in charge of coordinating the different involved departments for innovative projects, and are able to raid support.

Innovation champions were found to have the following (complementary) tasks: coordinating the different departments involved, seeking contacts and partners from inside and also outside the firm, regularly giving or organizing inspirational speeches, instilling an entrepreneurial and risk-taking culture, propelling innovation activities, as idea generation or evaluation events, coaching and empowering other intrapreneurs, and improving and communicating the innovation best practices.

Also a key aspect during the interviews was top-management support. The aim is to secure their support to make the rest of internal stakeholders feel more recognized and that they will not face barriers to innovating. From the majority of companies interviewed, it became evident that top management should: extensively communicate the relevance of innovation, explicitly recognize the innovation efforts, actively participate in innovation activities, and provide the sufficient resources. For instance, in Company A and B the top management actively engaged in the definition of the innovation activities and participates in some of them (i.e. CTO leads the awards ceremony). This was also the case of Company D and F.

Hierarchy

Once again, in line with the opening and 'democratization' trends that seems to be gathering momentum, hierarchical approach seems to be shifting from the traditional highly-bureaucratic and top-down structure to one that allows the different internal stakeholders to have an even input on the decision-making. However, the road ahead for achieving this full transition is still long, and the perception of whether the process is 'democratized' can highly depend upon who is asked. It is not surprising that top managers would claim is fully consensus, while lower-ranked workers may not feel so, as they don't freely provide their views and decision-making due to fear of reprisal by higher-ranked workers or bosses (Felin 2012). This is intended to be measured by Survey Question 8.4.

Your company's hierarchy is best described as...

Answer	Number	Percentage	
Authority-based hierarchy	2	29%	
Consensus-based hierarchy	5	71%	

Average: 1.7 ± 0.5
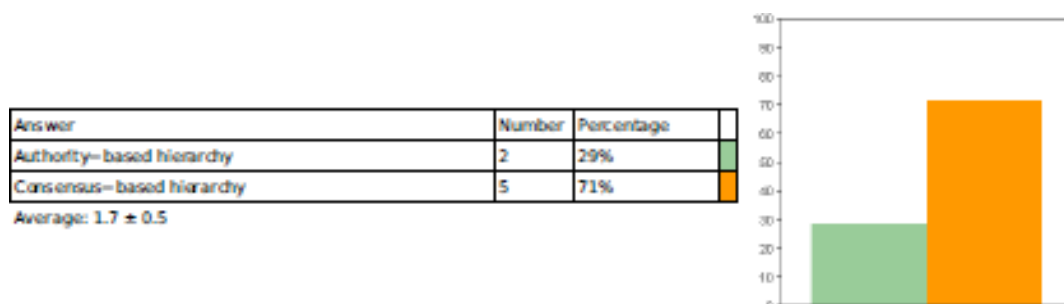
Fig. 29 Hierarchical setting

Consensus seems to be the most employed approach, which would go in line with the trend of best-performing organizations tending to increase the democratization of the process. However, a caution needs to be issued: the respondents of this study were middle or top managers, and may therefore not perceive strong hierarchy, while their lower rank colleagues within the company may well disagree, and not find that consensus is the decision-making approach, but rather that the views of the managers are the ones that are usually finally adopted.

b.3. Participation of external stakeholders

Following the 'opening' trend, seeking involvement is becoming increasingly important. However, not always is it crystal clear how to increase this engagement, and therefore identifying which measures are more effective for this increase is crucial. This is especially crucial for the idea generation, since at this stage the sources may see materialization of benefits derived from the generated idea more far away in time or certainty, and therefore may be more reluctant to contribute and participate. This is intended to be measured by Survey Question 2.3.

Which measures are used to promote participation and collaboration of external sources for the idea generation?

Answer	Number	Percentage	
Economic rewards	2	29%	
Explicit recognition	5	71%	
Knowledge-sharing	5	71%	
Business-sharing	5	71%	
Licensing	2	29%	
Alliances or partnerships	5	71%	
Providing seed capital to start-ups	1	14%	
Tutoring new ventures	3	43%	
Holding shares in start-ups	1	14%	
Web-based forums	2	29%	
Financing university projects	6	86%	
Others (specify)	0	0%	
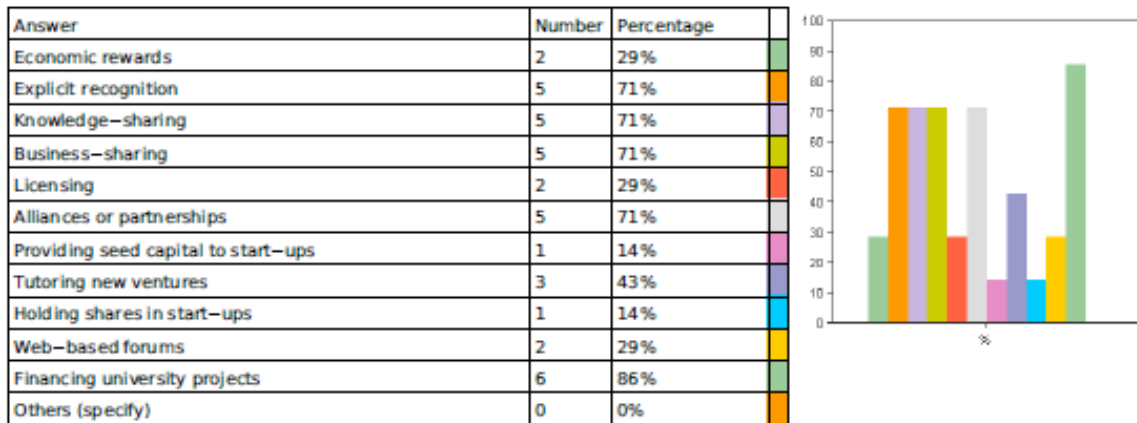
Fig. 30 Survey results: Measures for participation of external stakeholders

Universities seems to be the most selected approach, given the moderate cost and risk involved. For instance, Company F has established a network of over 200 universities with whom they have engaged in (co-financed) projects.

On the other hand, companies are still reluctant to engage in practices which involve significant deployment of resources (especially monetary) and risk, namely economic rewards or getting actively involved in start-ups, or added efforts and expertise such as web-based forums.

Participation of stakeholders may not be uniform and homogeneous throughout all the innovation process, and therefore it may require different procedures per stage. Specifically, for the idea detailing/pre-development and innovation development (stages which are of almost analogous nature, but take place at different periods of time in the innovation process). This is intended to be measured by Survey Question 6.5

> *Which procedures does your company use for enhancing participation of (internal and/or external) stakeholders in...?*

Procedure	For idea detailing (number of companies)	For innovation development (number of companies)
Crowdsourcing community	2	2
Contests	3	3
Primary market research	4	1
Workshops	5	3
Incentive–based programs	1	1
Online and offline product testing	4	2
Mass customization	1	0
Beta testing	3	3
TRIZ method	3	3
Quality Function Deployment	6	4
Conjoint analysis	6	5
Focus groups	5	3
Virtual teams for development of concepts	2	3

Fig. 31 Survey results: Methods for stakeholders participation in the idea detailing and innovation development phases

And rated in Survey Question 6.6 *How would you rate the effectiveness of the following procedures?*

Procedure	Rating: Average and deviation	Ranking by average
Crowdsourcing community	Average: 5.0 ± 1.7	10
Contests	Average: 6.3 ± 1.0	7
Primary market research	Average: 5.8 ± 1.5	8
Workshops	Average: 6.6 ± 1.3	4
Incentive−based programs	Average: 6.5 ± 0.7	5
Online and offline product testing	Average: 5.5 ± 1.3	9
Mass customization	Average: 5.0 ± 0.0	10
Beta testing	Average: 6.4 ± 1.5	6
TRIZ method	Average: 5.8 ± 1.7	8
Quality Function Deployment	Average: 7.2 ± 1.5	3
Conjoint analysis	Average: 7.2 ± 1.5	3
Focus groups	Average: 7.7 ± 1.0	1
Virtual teams for development of concepts	Average: 7.3 ± 0.6	1

Fig. 32 Survey results: Effectiveness of the stakeholders' participation methods

It is worth remarking the strong efforts carried out by Company G and its 'Open Innovation' facilitator or champion towards stimulating the engagement of other stakeholders (external, but also internal), as well as improving the innovativeness image of the company. This implied that: the O.I. facilitator is in charge of coordinating the tasks with the external partners, and has an allocation of 30% of its time for giving speeches and communicating to external partners about the company's innovation activities. In Company C there is an 'Open Innovation' senior manager in charge of coordinating all the implementation process, and empowers other innovation champions. Finally, in Company B there are 'challenge owners', persons in charge of managing a specific problem/innovation and to seek solutions/ideas (i.e. through external contest or internally) to solve them.

Also Company C engages in very active promotion of external participation. One way to do so was by lowering fear barriers from small companies or start-ups to team up with such a big corporation, concerning Intellectual Property protection. It does so by: showing them that the major company faces a higher risk of image damage if IP conflicts emerge, it provides them with seed capital to the incubate or develop the ideas, and tries to make a fully transparent process. This factor was in fact named by Company B as the biggest barrier that they faced ahead of launching the co-creation and open innovation platform (it took them nearly one year to fully study and address all the legal aspects concerning IP).

Furthermore, transparency in the innovation process can in turn enhance the participation. For instance, allowing the idea generators to closely monitor the progress of their idea, of their work, can be a motivator for further innovate in the future, as it allows them to ensure that the ideas generated by them are correctly treated and ultimately useful for the company. Not being transparent may lead to idea generators avoiding to submit new ideas, as they may not see their efforts reflected and being seriously-recognized. This is intended to be measured by Survey Question 6.1.

In your opinion, your company has a well-defined process for informing ideas' submitters about the status of the submitted idea...

Answer	Number	Percentage	
Strongly disagree	1	14%	
Moderately disagree	2	29%	
Neither agree nor disagree	0	0%	
Moderately agree	2	29%	
Strongly agree	2	29%	

Average: 3.3 ± 1.6
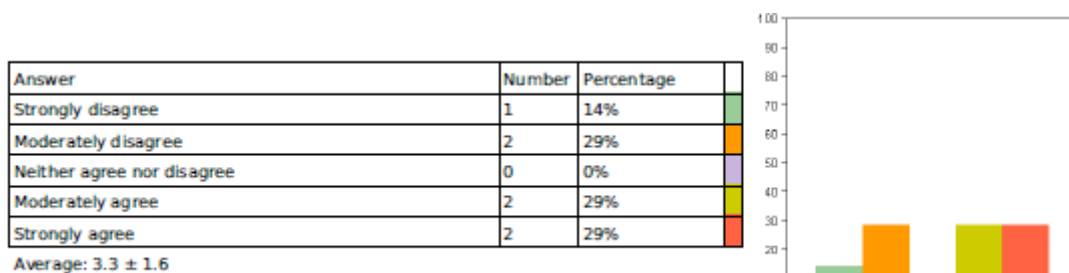
Fig. 33 Survey results: Idea status communication process

While the companies use an IT platform for idea submission, there are differing approaches as to how the idea submitters (internal or external) are aware of their evolution. During the interviews no specific mechanism, aside from via the IT platform itself, was found, so it is encouraged to uncover this in a following round of interviews.

Finally, cross-functional teams, as also highly remarked in the best-practices literature, respondents of the study heavily emphasized on the importance of cross-functional, multi-disciplinary teams.

Participation of external stakeholders in inbound Open Innovation activities

As shown in Chapter 3, companies have significantly different approaches to favored Open Innovation methods, based mostly on company/industry context or simply corporate tradition and current top management's preferences. Furthermore, each method may be more suitable to a different degree of Open Innovation implementation. For instance, strategic alliances may be a suitable first step towards Open Innovation, while spin-offs or venture investments may only apply for a later stage. All the above applies both to inbound and outbound methods. Therefore, it is expected in this study to face very differing results from each company. This is intended to be measured by Survey Question 7.1.

Which of the following activities does your company use for leveraging external innovations (inbound Open Innovation)? How effective are they?

Inbound activity	Number of companies using it	Rating given
In−licensing	6	Average: 6.0 ± 2.6
Alliances and other collaborative research projects	7	Average: 6.9 ± 1.6
Acquisitions	5	Average: 6.6 ± 2.4
Venture investments	3	Average: 5.3 ± 1.5
Others	2	Average: 6 ± 1.5

Fig. 34 Survey results: Effectiveness of the inbound Open Innovation modes

As it is seen, more 'traditional' agreements for engagement, such as alliances and in-licensing are still more favoured, but it is worth remarking that acquisitions also ranks high, an aggressive strategy which is less common for lower-than-average performing companies.

Company B considers that use of Venture investments or business angels could have significant potential, but is yet to be fully applied (for further results of this also read Co-creation section). On the other hand, Company C, Company D, Company F and Company G are more advanced in this respect, and both make use of incubators and 'new ventures' units for propelling external ideas.

In fact, Company G tries to attract entrepreneurs, and has established a process by which it evaluates 2-3 proposals every month by a panel of experts, in which it provides feedback to the entrepreneur, comprising the advantages and disadvantages of the proposal. If the idea still needs significant maturing, they re-direct them to an external incubator, and after a period of time evaluate again.

Participation of external stakeholders in outbound Open Innovation

This is intended to be measured by Survey Question 7.2.

Which of the following activities does your company use for leveraging innovations that would be otherwise internally abandoned (outbound Open Innovation)? How effective are they?

Outbound activity	Number of companies using it	Rating given
Out–licensing	4	Average: 5.5 ± 1.9
Spin–offs	2	Average: 4.5 ± 2.1
Joint ventures	4	Average: 5.0 ± 2.9
Strategic alliances	3	Average: 5.7 ± 3.2
Others	1	Average: 2

Fig. 35 Survey results: Effectiveness of the outbound Open Innovation modes

Nevertheless, outbound Open Innovation is still adopted to a lesser extent than inbound flows. For instance, while Company B intends to apply so in the future, especially regarding out-licensing or joint ventures for non-core innovations, it has not applied it to the date. Some ideas may be successfully outbounded to parent company rather than external stakeholders, company B claims.

However, Company C and Company G actively channel spin-offs and are able to leverage their benefits to some extent, although the benefits are still lower than other more 'traditional' approaches, namely out-licensing.

In addition, it is interesting to note that, as already found out in the literature, the adoption of outbound Open Innovation practices is still lower than those of inbound Open Innovation. This is suggested to be caused by fear of large companies to lose control over their IP.

Finally, it is worth remarking that to implement the Open Innovation paradigm, Company B decided to make use of Open Innovation 'broker', that is an third party that has previous know-how on the required challenges towards achieving the implementation of Open Innovation (independent specialized organizations or websites such as Innocentive, Ninesigma…). Flexibility is a key characteristic that this broker should have, as highlighted by the managers, in terms of being able to adapt to the specific context and factors of the company. It also manages the relationships with other partners, effectively acting as an intermediary, and keeps anonymity of Company B, so that the strategic efforts and aims of the company are not revealed to competitors.

b.4. Participation of customers

It is becoming more and more evident that the customers, the ultimate receivers of the added value, are increasingly important for the success of the products (Prahalad 2002). That is, the so-called 'voice-of-customer' needs to be taken into account carefully and extensively, and the sooner the better. For instance, a relevant contribution customer can make is shaping the characteristics of the

product or innovation, or establishing the demand of new needs, by means of delineating the attributes and features.

This is intended to be measured by Survey Question 4.1.

> *In your opinion, customers of the company actively participate in the definition of attributes and technical features of the product...*

Answer	Number	Percentage	
Strongly disagree	2	29%	
Moderately disagree	2	29%	
Neither agree nor disagree	0	0%	
Moderately agree	2	29%	
Strongly agree	1	14%	

Average: 2.7 ± 1.6
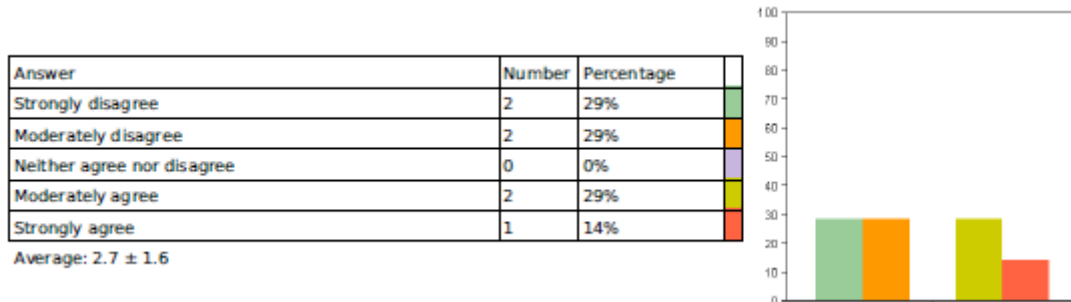
Fig. 36 Survey results: Customers participation in the definition of attributes and technical features of the product

In fact, as also backed by the conclusions extracted in the interviews, while companies are making strong efforts to increase the active input of customers since the early stage of the innovation process, even the leading companies realize they could still improve this aspect. It is worth noting, nevertheless, that the type of industry sets a very different customer profile, which also determines the type of customer involvement. For instance, for aerospace the customers are actually large firms, while for consumer electronics they are usually individuals; this implies different activities for engagement, different requirements and attributes process setting, different stage of the innovation process for starting the involvement, etc. This may place a bias to this question, and therefore it is difficult to extract unique conclusions.

An interesting practice for incorporating voice-of-customer is carried out by Company B. It has established a 'customer experience' team, embedded within the R&D department, which comprises not only engineers but also social scientists such as ethnographic specialists, psychologists, etc.

Once the product has shaped, and then further elaborated by the company's staff, harnessing further feedback can provide guidelines. These are aimed at detecting whether the product or innovation is heading in the right direction, and which new additions are possible, even leading to further arousal of opportunities that were not possible to be identified when the concept was less mature.

This is intended to be measured by Survey Question 6.3.

Does your company organize offline workshops and events with customers, such as contests/competitions, for engaging in concept development?

Answer	Number	Percentage	
Yes	4	57%	
No	3	43%	

Average: 1.4 ± 0.5
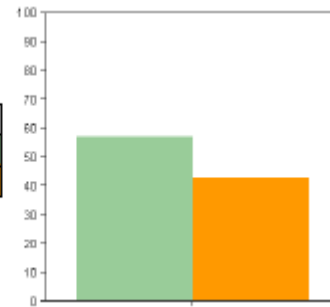
Fig. 37 Survey results: Organization of workshops and events with customers

Again, caution is needed for these results, due to the customers' different profile, which may in some case make more difficult to engage customers in workshops/events. Nevertheless, it is worth remarking that the 'customer experience' team previously mentioned tries to uncover social trends and individuals' behaviour, and actively engages with customers by means of for instance lead user workshops.

An alternative to development by means of offline ('in person' or 'face-to-face') cooperation between company and customers, is nowadays the use of online, internet-based platforms. A good example of these tools are the so-called 'online design environment'.

This is intended to be measured by Survey Question 6.4.

In your opinion, your company's users make significant development contributions in an 'online design environment'?

Answer	Number	Percentage	
Strongly disagree	0	0%	
Moderately disagree	3	43%	
Neither agree nor disagree	1	14%	
Moderately agree	2	29%	
Strongly agree	1	14%	

Average: 3.1 ± 1.2
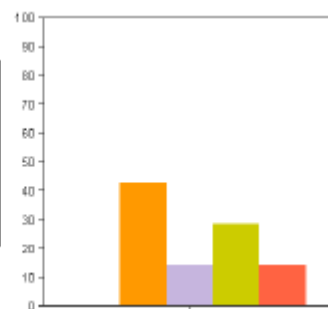
Fig. 38 Survey results: Contribution of customers to the product development by means of an 'online design environment'

Co-creation for generating and developing ideas.

As a mean of fully extending participation, and engaging customers at a higher and deeper level, Co-creation platforms are becoming the most effective method nowadays. But a certain focus has to be given. Does the company need to broaden the spectrum of ideas? Is it lacking original and

breakthrough ideas? Does it want to expand to further markets? Is its internal R&D failing to deliver sufficiently rich ideas? Or, on the contrary: Is it currently facing a specific challenge which is struggling to tackle? Or does it simply want to find 'out-of-the-box' ideas for breaking through their current product/market? As well, it is obvious to combine both approaches.

This is intended to be measured by Survey Question 2.6.

For idea generation, the main focus of your company's Co-creation platform is on...

Answer	Number	Percentage	
Solving existing specific problems	2	29%	
New ideas in general	1	14%	
Both equally	4	57%	

Average: 2.3 ± 1.0
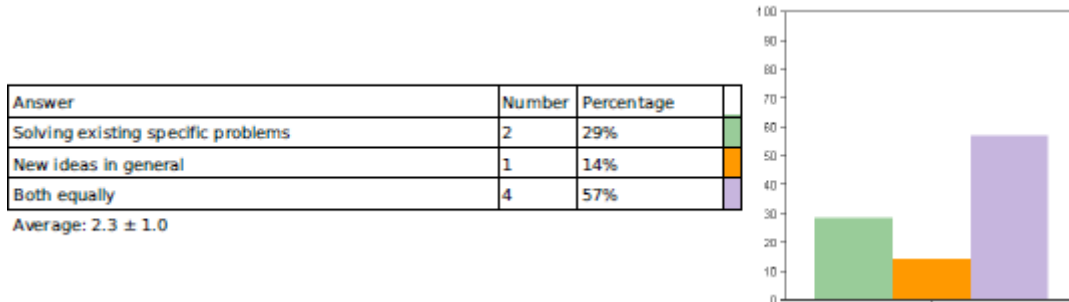
Fig. 39 Survey results: Main focus of the Co-creation platform

It was not found a univocally conclusive focus, and instead companies studied seem to use co-creation for both solving problems they are already facing, as well as finding out-of-the-box innovations, therefore ensuring a more balanced portfolio.

This is aspect is further intended to be measured by Survey Question 2.7.

Co-creation provides your company more effective results for innovations that focus on...

Answer	Number	Percentage	
Exploitation (Innovations focused on enhancing current business or products of the company)	5	71%	
Exploration (Innovations focused on business or product areas new to the current company focus)	1	14%	
Both of them equally	1	14%	

Average: 1.4 ± 0.8
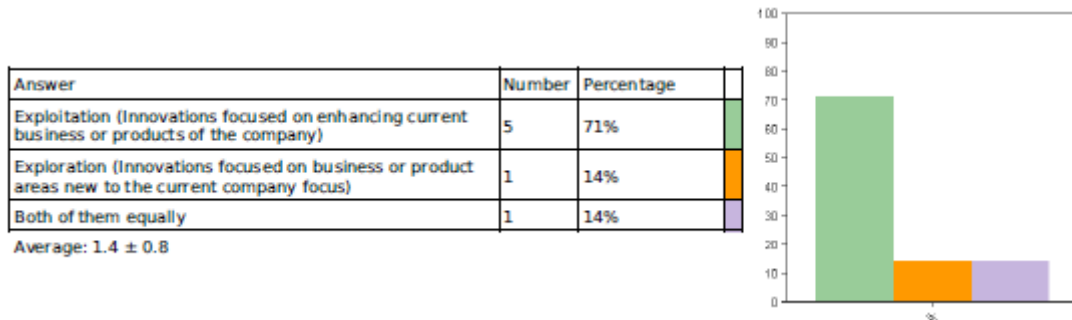
Fig. 40 Survey results: Orientation effectiveness of Co-creation platform

While companies have a more balanced approach with regards to the idea characteristics (evolutionary vs. radical ideas), when it comes to the focus of companies, it is clear that they still opt to use co-creation to strengthen their core areas rather than using it as an expanding tool. This may be because co-creation is perceived more as a complementary tool, rather than a central element, and therefore more suitable to support the core activities.

Overall, combining both aspects, for instance, two of the companies studied had a platform in which they launched specific challenges (i.e. solving one existing problems) but also tried to explore solutions even in fields which were not currently their core businesses.

Co-creation platform can aim not only to customers, but also start-ups, SMEs and even other big corporations, focusing not only on new products but also new business and services, as Company B intends. This is already applied in the case of companies C, F and G.

Implementing Co-creation may not be as straight forward as it may appear at first glance. It will not deliver results by simply creating a website with an inbox for ideas. It requires first knowing which approach to take, which know-how and resources are necessary, how to run it, etc. From the literature review and results found in this study, the degree of Co-creation implementation defines how the company should run the online Co-creation platform. It may have the sufficient expertise or it may first require the cooperation of an external organization (NineSigma, Innocentive, Yet2, etc.) with previous experience in co-creating with customers.

This is intended to be measured by Survey Question 2.8.

Your company runs the Co-creation platform / innovation 'marketplace'...

Answer	Number	Percentage	
Directly	5	71%	
Outsourced to specialized marketing companies	1	14%	
Via independent websites (such as InnoCentive, NineSigma?)	1	14%	

Average: 1.4 ± 0.8
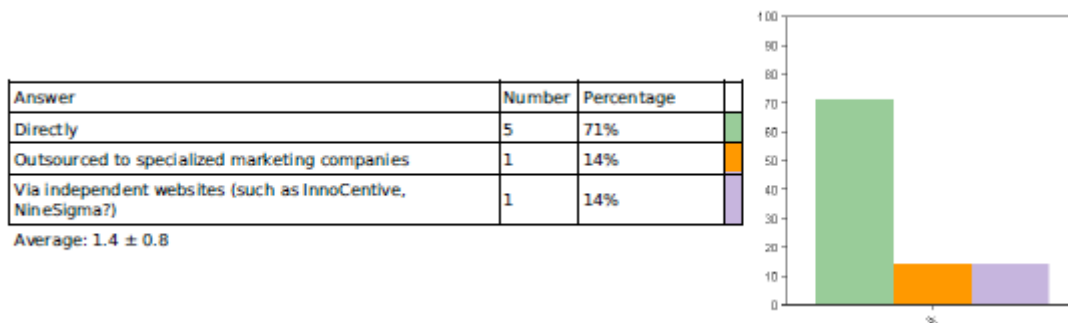
Fig. 41 Survey results: Co-creation platform approach

It was found through the interviews that companies prefer to run the co-creation tools directly once they have fully understood and interiorized the implications, but many of them first did an initial iteration by means of an external intermediary, for instance as a pilot program. This allows them to reduce failure risk and increase their learning for future iterations.

Furthermore, an advanced form of co-creating with users is the so-called 'open source'. However, it has to be noted that the adoption or not of open-source schemes is currently heavily reliant on the industry at which the company belongs to. For instance, software companies are pioneers in this respect, while automotive manufacturers could still be considered laggards.

This is intended to be measured by Survey Question 4.2.

Does your company use an open-source platform?

Answer	Number	Percentage	
Yes	4	57%	
No	3	43%	

Average: 1.4 ± 0.5
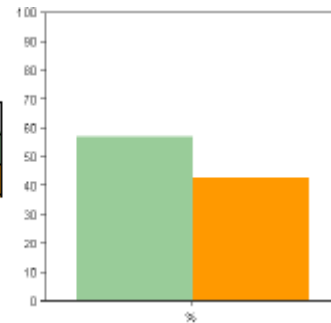
Fig. 42 Survey results: Open-source platform use

As argued before, this inconclusive results may be well biased by the different natures of the industries. It is nonetheless worth mentioning that one major issue of co-creation implementation (and of open source) is fully addressing the legal aspects of IP. For instance, Company B needed approximately one year to completely sort out all the legal concerns for launching a Co-creation platform.

The company may also need to adapt to be prepared for implementing the co-creation platform and embracing its philosophy. This may include organizational re-structuring. This is intended to be measured by Survey Question 8.4.

In order to implement Co-creation, which degree of organizational changes did your company carry out?

Answer	Number	Percentage	
A new specific co−creation division was created	2	29%	
Marketing department adapted to lead the co−creation management	0	0%	
R&D department adapted to lead the co−creation management	3	43%	
Co−creation management is jointly lead by adapted Marketing and R&D departments	0	0%	
Structure and roles were not affected	2	29%	

Average: 3.0 ± 1.6
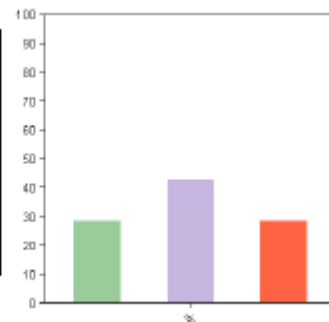
Fig. 43 Survey results: organization changes for implementing Co-creation

Together with the interviews and literature, it was found that the most advanced companies in co-creation made significant changes to their structure in order to fully embrace the co-creation paradigm in a more effective way. Most avant-garde companies created a specific division, which embodied cross-functional members, in order to fully extract the benefits of co-creation, as it was also the case of Ducati and Eli Lilly found in the scientific literature (Sawhney 2005).

c. Deliberation

c.1 Ideation deliberation methods and effectiveness

This implies both quantity and quality of ideas. It became evident, from the majority of studied companies, that quantity of ideas is not an issue. Instead, the main concern is quality. In order to ensure quality, Company B uses support from creativity experts. Company G ensures that idea submitters are previously aware of the requirements to pass the evaluation phase, for instance to submit specific and realistic sales target.

This quality is further ensured by extensive and systematic use of well-proven methodologies that enhance the deliberation of individuals, such as empathic design. This is especially true for idea generation. The array of methods used was very wide, however, they may have differing effectiveness, adoption rates… The most suitable methods can be found in Fig. 44 and in the Section 6.2. "Best" practices towards a more Responsible Innovation process. This is intended to be measured by Survey Question 2.5.

Which methods for idea generation does your company use? How effective are they?

Methods	Number of companies using it	Rating: Average and deviation
Suggestion box	6	Average: 4.2 ± 2.1
Brainstorming sessions	7	Average: 6.9 ± 1.1
Internal meetings with colleagues	7	Average: 6.4 ± 1.7
TRIZ method	3	Average: 6.3 ± 1.5
Reverse engineering	4	Average: 5.8 ± 2.1
Workshops	7	Average: 6.7 ± 1.5
Competitive intelligence analysis	5	Average: 5.6 ± 1.5
Quality Function Deployment methods	5	Average: 7.4 ± 2.2
Crowdsourcing	4	Average: 5.3 ± 2.5
Focus groups with potential users	6	Average: 7.2 ± 2.0
Scenario analysis	6	Average: 7.0 ± 2.1
Web scouting	4	Average: 5.0 ± 2.4
Lead users	6	Average: 6.5 ± 2.5
Empathic design	4	Average: 6.8 ± 2.6
Contests	6	Average: 5.3 ± 1.5

Fig. 44 Survey results: Effectiveness of the idea generation methods

For instance, Company B underwent a transition from 'focus groups' use to 'design thinking' methodology. This implies an even more active approach, by which employees directly observe

potential customers, by 'following' them in their daily life, to try to uncover their tacit needs and identify new opportunities. This is similar to the case of Levi's shown in Chapter 3. Nevertheless, focus groups are still highly regarded, and in fact considered as the most effective method. On the other hand, for instance Company E makes extensive use of lead users, engaging them for long periods, and monitors their progress afterwards.

c.2. Values assessment

As indicated in the theoretical background, a large range of values have to be assessed in-depth in order to be considered a Responsible Innovation process. These values relate to how the innovation/product created by the company affects or interacts with the rest of stakeholders, especially customers/users. This is intended to be measured by Survey Question 3.1.

In your opinion, the following criteria are sufficiently assessed during your company's innovation process...

Value	Rating of agreement: Average and deviation (where 1= strongly disagree; 5 = strongly agree)
Impact on environment (environmental sustainability)	Average: 4.7 ± 0.5
Societal impact as a whole (social sustainability)	Average: 4.1 ± 0.9
Affordability (economic sustainability)	Average: 4.9 ± 0.4
Cooperativeness	Average: 3.6 ± 1.0
Transparency	Average: 3.3 ± 1.3
Safety	Average: 4.9 ± 0.4
Autonomy	Average: 4.0 ± 0.9
Accountability	Average: 4.7 ± 0.5
Sense of ownership	Average: 4.4 ± 0.8
Community	Average: 4.0 ± 0.6
Universal usability	Average: 4.3 ± 0.5
Cultural differences between regions	Average: 4.1 ± 0.7
Trust	Average: 4.3 ± 0.8

Fig. 45 Survey results: Assessment of values

Predictably, the sustainability aspects head the ranking. For evaluating them, for instance company D and E make use of 'must-meet' check-lists for environmental sustainability, of CBA for economic sustainability and of panel of experts for social and environmental sustainability.

Also it is remarkable that safety is extremely important and fully embodied, due to both legal and ethical considerations that have been incorporated for decades within the corporate culture.

Interestingly, accountability is highly rated, while literature review showed that there is still far from achieving the fully desirable level, as it is also the case of the direction policy-making is heading (van den Hoven 2013). This may well be an issue of perception. This caution for possible mis-match perception is further reinforced by the fact that on the other hand a variable that is generally linked with accountability, transparency, is rated much lower.

c.3. Deliberation for the decision-making gates

Making a well-informed, accurate evaluations and selection of ideas can even become the most crucial steps of the innovation process. They can save significant amount of resource waste, and increase the success rate of the products (Cooper 2008). Therefore, this implies applying the suitable decision-making supporting tools. This is intended to be measured by Survey Question 5.1.

Which decision-making support tools does your company use for the stages of...?

Tools	For idea evaluation	For idea selection
Portfolio analysis	6	6
Cost−benefit analysis	5	7
Scoring models	5	6
Competitor analysis	6	3
Expert evaluation	6	5
Workshops	5	4
Online surveys	4	2
Customer online forums	5	1
Check−lists of 'must meet' and 'should meet' criteria	5	5
Advisory programs supported by R&D and marketing staff	5	7
Web−based platforms	3	3

Fig. 46 Survey results: Decision-making support tools

This is also intended to be measured by Survey Question 5.2.

How would you rate the effectiveness of the following tools?

Tool	Rating: Average and deviation
Portfolio analysis	Average: 7.6 ± 1.5
Cost–benefit analysis	Average: 8.0 ± 1.0
Scoring models	Average: 7.6 ± 1.4
Competitor analysis	Average: 7.8 ± 1.3
Expert evaluation	Average: 7.7 ± 0.5
Workshops	Average: 7.0 ± 1.6
Online surveys	Average: 6.0 ± 1.4
Customer online forums	Average: 5.3 ± 2.1
Check–lists of 'must meet' and 'should meet' criteria	Average: 7.7 ± 1.5
Advisory programs supported by R&D and marketing staff	Average: 7.9 ± 1.7
Web–based platforms	Average: 4.3 ± 2.1

Fig. 47 Survey results: Effectiveness of the decision-making support tools

For evaluating and selecting an idea, in Company B the idea generators or champions must first deliver an 'elevator pitch' (brief speech, of around 1 minute, in which the communicator highlights the key aspects the value proposition they want to convey) and at a later stage they are requested to provide more detailed information. The ideas are evaluated by a team of internal reviewers, of cross-functional nature or formed by the process owner (i.e. the idea addresses the topic of one R&D sub-unit and then the director of that area is the one in charge of reviewing the idea). At this point, it is important to emphasize that a key successful selection factor was claimed to be properly coupling the ideas to specific existing development programs. This in turn avoids ideas submitters' frustration.

In Company E, the deliberation progressively scales up in the hierarchy. It has a process by which: 1st gate at 'specialists' or 'idea champions' level, with involvement of one vice-president; 2nd gate at vice-presidents level, 3rd concerning product strategy at board of directors level. This ensures decision making which provides a more holistic view, as well as securing support.

Company G keeps track of all projects and ideas, having a specific form to fill in the lessons learned & the 'no go' conditions/context. This enhances their deliberation, avoidance of future mistakes and reduces inefficiencies (i.e. of trying to 'retake' a project when actually the 'no go' conditions did not change or were forgotten).

d. Responsiveness

How is the company reacting to the potential impacts of the innovation and its perception by users, in the shape of feedback? This can be address efficiently by means of an online Co-creation platform. But the way this feedback is channeled and enriched can take multiple shapes. And therefore the company may take different approaches. It may focus first, for evaluation, or a wide but superficial data gathering or narrow but deep. That is, large sample of users asked only a small number of questions via a survey, or a small community of devoted users with in-depth and high level of know-how interaction, as it was detailed in the Ducati example of the previous chapter. This is intended to be measured by Survey Question 3.2.

For the idea generation and evaluation stages, your company's Co-creation platform with users focuses on...?

Answer	Number	Percentage	
Broadness (superficial data from large sample and range of users)	1	14%	
Deepness (insightful data from reduced sample and range of users)	2	29%	
Intermediate compromise between them	4	57%	

Average: 2.4 ± 0.8
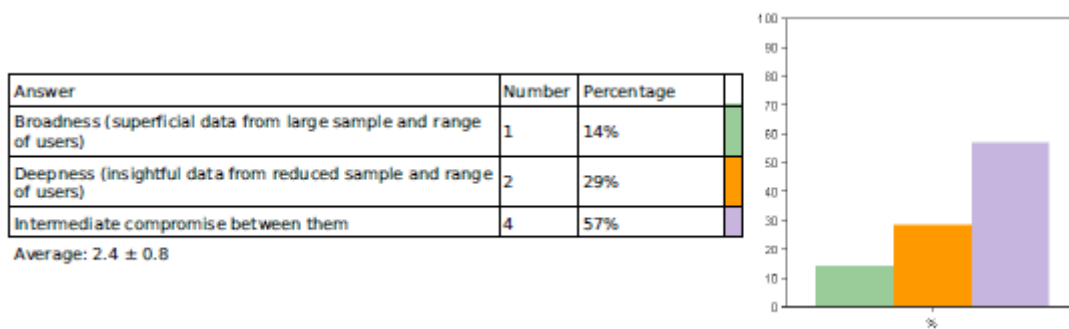
Fig. 48 Survey results: Co-creation platform focus

Unsurprisingly, a blend strategy is the most used one, in order to better adapt to the different information requirements. That is, deep information to have insightful information about customers' needs and broad one to further validate the results or to obtain a more general view of the areas where to focus.

In addition, Company A reacts to the anticipated future trends within internal cross-functional teams, which are in charge of identifying and prioritizing the different focus areas and opportunities.

e. Reflexivity

For instance, Company B makes use of a repository, considered a major asset for the company, which contains the selected ideas. It helps conveying recognition, that the "ideas of each employee are valuable and used". Ideally, this repository should be handled via a smart database, which facilitates search by for instance tags/keywords or themes. Furthermore, it allows a paused reflection by employees, and coupling solutions with problems, as indicated by Company B.

Note here that the majority of reflexivity-ensuring practices, likewise to responsiveness, are also connected to other dimensions, hence already mentioned in previous sections.

Chapter Conclusions

It became evident that while the studied companies are still at different stages of adoption of the more novel innovation approaches and belong to different industries with significantly different characteristics, there are many common trends identified. The practices found in this empirical study seem to align with those found in the literature for best-in-class literature, allowing for obtaining a relevant set of best-practices.

It is worth noting that the amount of information collected was vast, and therefore here only the key information could be shown. For a more conclusive understanding, it is strongly encouraged to refer to Chapter 6. Best-practices framework.

Chapter Summary

In this chapter the empirical research carried out in this study was elaborated. Firstly, the case study company and its contextual frame was shown. That is, its context at industry level and at specific characteristics, and the current status quo of its innovation process. Thereafter, the results derived from the empirical research are reviewed. That is, the data extracted from the survey and from the semi-structured interviews. Again, this data was structured following the framework of analysis presented in Chapter 3.

Chapter 6
Best practices framework

Chapter 6. Best-practices framework

In this chapter, the best-practices derived from the thesis study are listed and briefly explained or justified. They are combination of those extracted from empirical results of the benchmarking (Chapter 5. Empirical research and results) and those from the literature review (Chapter 4: "Better" practices identified from the literature), and are framed in a highly-practical approach for the companies' managers to apply.

6.1. Adaptation of best-practices to context

Adapting the best-practices is, in itself, a challenging task and not as simple as it may appear (Graves 2012). Extrapolation is in this case far from simple imitation, as not necessarily may the practices of one organization produce then same outcomes when applied by another organization. Even managers are aware of this, and pledge for caution. As one of our interviewees claimed in a very simple but clear way *"what works for Google may not necessarily work for us"*. This is especially true to knowledge-based and highly-skilled activities, which are more difficult to objectify and scientists are still heavily exploring. In fact, best-practices of this kind may be considered as a value-based perspective rather than objective 'truth' perspective (that would apply to for instance manual tasks) (Graves 2012).

Context is also a multi-dimensional factor that plays a significant role in this process. In fact, while best-practices are compilation of practices that have been observed to be effective for those organizations, they still need to be shaped to the specific context, to be 'adapted and adopted'. This leads to a cultural change within the firm, adoption, which his not encompassed in detail within the scope of this thesis document.

It is suggested (Burrin 2007, Graves 2012) that, in order to carry out this process, the following steps have to be followed:

- Extracting the context-independent dynamics or practices
- Identifying the reasoning behind those practices being 'best' within that context
- Recognizing those approaches affecting the company's context
- Re-combining both streams
- Adapting also at sub-variable level
- Adopting the practices and methods

- Reviewing and evaluating regularly the applied methods for further adapting to the dynamic context and capabilities

Finally, it is worth noting that for a fully successful implementation of this adaptation, it is necessary to engage in a continuous process, constantly gathering new practices and constantly incorporating them to the company's improvement strategy.

It has to be noted that the majority of factors studied within both this empirical research and the extracted literature practices are valid across industries (for instance leadership, participation, etc.). Furthermore, already since the start of the project the adaptation was embedded within the methodological approach. For instance, the survey and the semi-structured interview script were designed already bearing in mind this fact.

The case-specific context has already been explained in Section 5.2. Case study: The SEAT case. Therefore, in this Chapter only general guidelines are provided for which of the aforementioned practices are suitable for SEAT and car manufacturers. Specific 'action plan' recommendations are issued in Chapter 7.

6.2. "Best" practices towards a more Responsible Innovation process

Hereby, the best-practices are listed. These are a selection of the 'better' practices found in the previous chapters, geared towards a suitable application by the automotive OEMs. The selection is based on adaptability to these firms' characteristics and context, as well as being considered of higher effectiveness overall.

The practices are shown with the following structure: firstly, an statement and description the practice and how it carried out; secondly, the dimensions from the Responsible Innovation framework that they address; thirdly, the stage of the innovation process at which they are deployed; finally, the aim or purpose, the 'why' of this practice. They are ordered by the Responsible Innovation dimension they ensure or affect. However, many of them may ensure or affect multiple dimensions, and are therefore listed in the final part (Section f. Multi-dimensional practices).

a. Anticipation

Best-practices that only affect anticipation:

Best Practice 1: Defining the strategic fields where to focus innovation efforts based on their overall business objectives as well as strategic stakeholders and customer insights.

These are obtained by methods such as: scenario analysis, portfolio analysis, foresight, mega-trends and systematic web scouting. These methods can be used complementarily. Other methods such as Delphi method were less used due to concerns of revealing to external parties or competitors the company's aims.

Dimensions addressed: Anticipation (opportunity identification).

Stage of innovation process concerned: Strategic orientation.

Aim: To solidly identify socio-technical trends and the underlying implications of technology, therefore finding which fields can deliver more suitable opportunities to the company.

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b. Participation

Best-practices that only affect participation:

Best Practice 2: Having in place processes which ensure the recognition of idea contributors. For instance, ensuring that managers explicitly recognize the efforts and merits of idea submitters.

Dimensions addressed: Participation (internal stakeholders).

Stage of innovation process concerned: Idea generation.

Aim: To embed innovation into daily business and therefore, strengthening the innovation culture. Consequently, employees are actively motivated and regularly engaged in idea generation activities related to the focused areas.

Best Practice 3: Rewarding idea contributors by means of participation in innovation activities (i.e. conferences), top-educational programs (i.e. MBAs) and prizes (i.e. within an innovation contest and award ceremony). Non-financial rewards are considered more effective and used than financial rewards.

Dimensions addressed: Participation (internal stakeholders, external stakeholders).

Stage of innovation process concerned: Idea generation.

Aim: To stimulate stakeholders to participate and increase their self-fulfillment feelings. Consequently, employees are actively motivated and regularly engaged in idea generation activities related to the focused areas.

Best Practice 4: Using inspiring communication, talks and information on socio-technical trends.

Dimensions addressed: Participation (internal stakeholders).

Stage of innovation process concerned: Innovation process overall.

Aim: To raise attention and attraction towards innovation-related activities, and specifically idea generation. Consequently, employees are actively motivated and regularly engaged in idea generation activities related to the focused areas.

Best Practice 5: Promoting the use of an idea repository that is robust and easily accessible (to all employees).

Dimensions addressed: Participation (internal stakeholders).

Stage of innovation process concerned: Innovation process overall.

Aim: To better storage knowledge, and also contribute to the ideas' 'democratization' and convey to all employees the message that "your idea has value".

Best Practice 6: The innovation process is facilitated and fostered by the presence and institutionalization of different leading roles, such as *'innovation champion'*, *'innovation teams'*, *'integrators'*, *'challenge owner'*, *'open innovation facilitator'*, which have the following tasks:

- Coordinating the different departments involved
- Seeking contacts and partners from inside and also outside the firm
- Regularly giving or organizing inspirational speeches
- Instill an entrepreneurial and risk-taking culture
- Propel innovation activities, as idea generation or evaluation events
- Coaching and empowering other intrapreneurs
- Improving and communicating the innovation best practices

Dimensions addressed: Participation (internal stakeholders, external stakeholders).

Stage of innovation process concerned: Innovation process overall.

Aim: To enhance the innovation process by means of leaders in multiple aspects (increased internal and external coordination and collaboration, increased entrepreneurial and innovation-oriented culture, speeding up the innovation process, etc).

Best Practice 7: Rotation of the innovation department/team members regularly (i.e. yearly).

Dimensions addressed: Participation (internal stakeholders).

Stage of innovation process concerned: Innovation process overall.

Aim: To increase the number of internal stakeholders actively involved in innovation and therefore spread the innovation culture among the organization.

Best Practice 8: Companies' top-management show strong commitment and support towards innovation by:

- Extensively communicating relevance of innovation

- Explicitly recognizing the innovation efforts

- Actively participating in innovation activities

- Providing the sufficient resources

Dimensions addressed: Participation (internal stakeholders).

Stage of innovation process concerned: Innovation process overall.

Aim: So that innovation's importance and performance is embodied by all internal stakeholders, which requires that employees are strongly aware of this and feel that their efforts towards innovation are supported and recognized.

c. Deliberation

Best-practices that only affect deliberation:

Best Practice 9: Having a set of decision-making support methodologies, for both the idea evaluation and the idea selection gates. These are: portfolio analysis, cost-benefit analysis, panels of experts, scoring models, scoring models, competitor analysis, expert evaluation, workshops, online surveys, customer online forums, check-lists of 'must-meet' and 'should-meet' criteria, advisory programs.

Dimensions addressed: Deliberation.

Stage of innovation process concerned: Idea evaluation, Idea selection.

Aim: To have a more transparent process, and therefore all stakeholders are more likely to engage. Furthermore, to have a more consistent evaluation throughout time and throughout the range of submitted ideas. In addition, the agreement of this criteria helps ensuring democratization and support across organization.

Best Practice 10: Idea proponents are asked to submit specific information about ideas for their evaluation, such as which is the customer problem addressed, is there the internal and external capabilities for developing the idea, etc. These can be submitted via a form, via an IT platform or by giving an elevator pitch.

Dimensions addressed: Deliberation.

Stage of innovation process concerned: Idea evaluation.

Aim: To increase the deepness of the reflection that idea proponents undergo before officially submitting their idea, so that it is a more solid and well-thought idea.

d. Reflexivity

From the best-practices selected which relate to reflexivity it was found that they also affected other dimensions, therefore they are instead listed in Section f. Multi-dimensional practices.

e. Responsiveness

Applies similarly to the Reflexivity dimension, hence the corresponding best-practices can be found in Section f. Multi-dimensional practices.

f. Multi-dimensional practices

Hereby are listed the best practices that entitle or affect more than one Responsible Innovation dimension simultaneously.

Best Practice 11: Carrying out technology and innovation scouting either through an external specialist or by employing dedicated "innovation scouts" (specialists tasked with identifying new opportunities for partnership, co-development, licensing, or acquisition), jointly run by R&D and Marketing departments. Similarly, actively use (online) market intelligence.

Dimensions addressed: Anticipation (opportunity identification), Deliberation.

Stage of innovation process concerned: Strategic orientation, Idea generation.

Aim: To better explore the external environment and detect promising or disruptive opportunities.

Best Practice 12: Evaluation the socio-technical implications and impacts of a certain opportunity/innovation, by means of a structured and holistic approach, for instance consulting experts and academicians from multiple fields (both social and technical).

Dimensions addressed: Anticipation (opportunity identification), Deliberation.

Stage of innovation process concerned: Strategic orientation, Idea evaluation.

Aim: To ensure that the interactions and consequences of the opportunities and innovations with the society are deeply assed.

Best Practice 13: Prioritization of the focus areas according to their contribution to the overall business objectives, the internal and external capabilities available and/or management strategic perspective.

Dimensions addressed: Anticipation (opportunity prioritization), Deliberation, Reflectivity, Responsiveness.

Stage of innovation process concerned: Strategic orientation.

Aim: To consider the most relevant factors that could affect the success or failure of the innovations within the selected focus areas.

Best Practice 14: Prioritization is systematically done by means of supportive methodologies such as: portfolio analysis, scoring models, risk assessment, innovation roadmaps and prediction models. These methods can be used complementarily.

Dimensions addressed: Anticipation (opportunity prioritization), Deliberation.

Stage of innovation process concerned: Strategic orientation.

Aim: To adequately and systematically allocate the resources in areas where there is a higher likelihood of supporting the company's business objectives.

Best Practice 15: The opportunity prioritization is carried out by top management and cross-functional teams or committees.

Dimensions addressed: Anticipation (opportunity prioritization), Participation (internal stakeholders).

Stage of innovation process concerned: Strategic orientation.

Aim: To give a more holistic perspective, as well as gathering higher support across the organization given that the decisions are agreed even by consensus.

Best Practice 16: The focus arenas are intensively and regularly communicated internally. This is done by means of workshops, corporate informative sessions, informal sessions. Additionally this is backed by newsletters.

Dimensions addressed: Anticipation (communication of opportunities), Participation (internal stakeholders).

Stage of innovation process concerned: Strategic orientation.

Aim: To ensure that the organization is aligned, and a higher number of internal stakeholders are aware and engage in the innovation activities.

Best Practice 17: Providing the internal stakeholders with 'toolboxes' (set of supporting methodologies), internal and external supports which enhance creativity and motivation. The most suitable provided methodologies are usually: co-creation workshops, regular meetings and brainstorming.

Dimensions addressed: Participation (internal stakeholders), Deliberation.

Stage of innovation process concerned: Idea generation.

Aim: To facilitate the participation of stakeholders and increase the performance of the idea generation activities. Consequently, employees are actively motivated and regularly engaged in idea generation activities related to the focused areas.

Best Practice 18: Having specific (physical or virtual) spaces in which stakeholders can carry out ideation. For instance, a creativity room or lab, or a virtual IT platform.

Dimensions addressed: Participation (internal stakeholders), Deliberation.

Stage of innovation process concerned: Idea generation.

Aim: To place stakeholders in a mindset that reduces barriers to creativity. Consequently, employees are actively motivated and regularly engaged in idea generation activities related to the focused areas.

Best Practice 19: Directly involving customers in the idea generation process. Alternatively, a pool of internal stakeholders can be used, as a sort of 'mock-up'.

In order to involve customers, the most useful methods are: empathic design (which includes following and observing customers in their daily life), web-based platforms, internet and social media-scouting and consumer reviews. Furthermore, other more traditional methods may prove effective, such as lead users, focus groups, SERVQUAL (Expectations vs. Results gap), surveys and interviews.

Dimensions addressed: Participation (customers), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Idea generation, Idea evaluation.

Aim: To obtain more customer-oriented ideas. The combination of methods facilitates the generation of customer insights difficult to get otherwise. Deep customer understanding is considered critical for providing them with valuable products and for enhancing the customer experience.

Best Practice 20: Gathering the voice of customer online throughout the innovation process. Methods vary depending on the process and stage and on the type of data desired. This is illustrated in the **Error! Reference source not found.** below.

Dimensions addressed: Participation (customers), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To better incorporate the voice of customer, through more avant-garde methods.

Applicability to Stage of New Product Development Process

	Front-end (Ideation and Concept)	Back-end (Product Design and Testing)
Deep/ High Richness	Suggestion Box Advisory panels Virtual communities Web-based idea markets	Toolkits for users innovation Open-source mechanisms Web-based patent markets
Broad/ High Reach	Online survey Market intelligence services Web-based conjoint analysis Listening in techniques	Mass customization of the product Web-based prototyping Virtual product testing Virtual market testing

Nature of Collaboration

Fig. 49 Online Co-creation methods per stage and aim of information collection (Sawhney 2005)

Best Practice 21: Using a wider range of tools and adequately preparing the ideation activities. The suitable tools are: co-creation workshops, design thinking, empathic design, brainstorming. Furthermore, internal and external experts may support the generation and evaluation process.

Dimensions addressed: Participation (customers, internal stakeholders, external stakeholders), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Idea generation, Idea evaluation.

Aim: To increase the quality of ideas generated and filtered.

Best Practice 22: To have a 'customer experience' team, embedded within R&D. This team is formed not only by technicians but also by social scientists (i.e. psychologists, ethnographic experts, etc).

Dimensions addressed: Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To better understand the customers' articulated and unarticulated needs. To enhance participation of internal stakeholders.

Best Practice 23: Multidisciplinary teams are used for the evaluation of ideas. These may have external assistance if needed (i.e. consulting external experts).

Dimensions addressed: Participation (internal stakeholders), Deliberation.

Stage of innovation process concerned: Idea evaluation.

Aim: To increase democratization of the process and provide a more holistic perspective for the evaluation.

Best Practice 24: Setting clear criteria, agreed by the different departments, established according to the objectives that innovation should achieve.

Dimensions addressed: Participation (internal stakeholders), Deliberation.

Stage of innovation process concerned: Idea evaluation, Idea selection.

Aim: To have a more transparent process, and therefore all stakeholders are more likely to engage. Furthermore, to have a more consistent evaluation throughout time and throughout the range of submitted ideas. In addition, the agreement of this criteria helps ensuring democratization and support across organization.

Best Practice 25: For the evaluation process, extensive feedback to idea proponents is usually provided (i.e. of strengths and weaknesses of the idea). These feedback is provided by means of: discussions, panel of experts, IT platforms.

Dimensions addressed: Participation (internal stakeholders), Deliberation.

Stage of innovation process concerned: Idea evaluation.

Aim: To ensure that idea proponents feel well-guided and supported, and are able to polish the potential shortcomings of their ideas.

Best Practice 26: Customers are actively involved in the pre-development/detailing of ideas

Dimensions addressed: Participation (customers), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Idea detailing.

Aim: To have a constant input from customers once the idea already has some 'shape'. to improve product concepts as well as to test customer acceptance and fit and gaps to their needs.

Best Practice 27: Innovation project learning is codified, by means of for instance innovation project cards that store the following information:

- The aspects that failed and could be improved in future projects
- The conditions and context that lead to halting the project

Dimensions addressed: Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim:. to learn lessons from past failures and to ensure that if the project is considered for revival at later time, the conditions/context that lead to the halting of project have changed sufficiently.

Best Practice 28: The innovation process is structured as a stage-gate model and its performance is regularly assessed in order to introduce modifications if required. In order to support this assessment, the methods used are: Six-sigma methodologies, KPIs review, workshops and discussions.

Dimensions addressed: Deliberation, Reflexivity, Responsiveness

Stage of innovation process concerned: Innovation process overall.

Aim: To use the experience gained through innovation activities to introduce modifications in the innovation process which allow to achieve the objectives related to innovation

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Best Practice 29: Actively communicating the innovation challenges to external stakeholders and engaging them systematically, therefore effectively embracing the Open Innovation paradigm. These stakeholders may be for instance universities, suppliers, entrepreneurs and external experts. The forms used for engaging them are:

- Open innovation brokers and consultants
- Innovation calls or contests through web-based or internet platforms
- Panels of experts
- Workshops, speeches and discussions

Further approaches are used, as shown in Fig. 50.

Dimensions addressed: Participation (external stakeholders), Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To facilitate the generation of incremental and as well as more radical ideas. Experts are consulted in order to evaluate ideas related to their specific areas of knowledge (technical, commercial, business development, etc). Also, the communication is done for increasing the innovativeness image of the company towards outside.
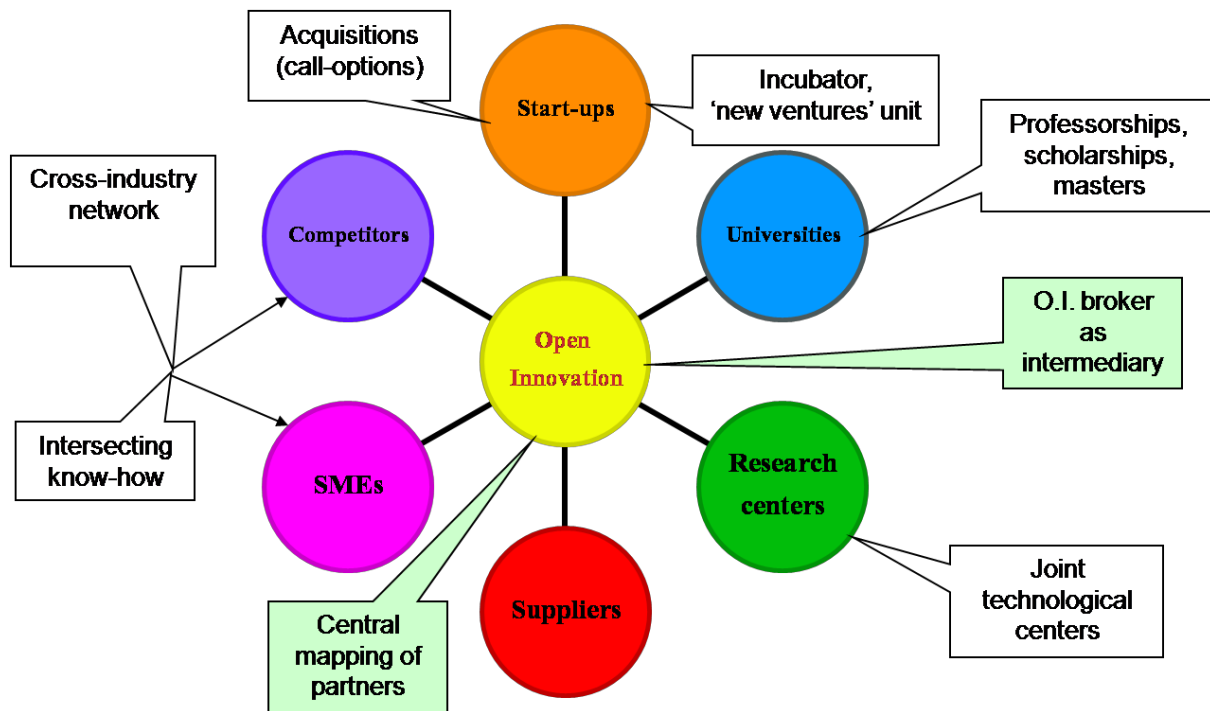
Fig. 50 Methods and activities for engagement with external stakeholders found in the empirical research (own elaboration)

Best Practice 30: Additionally, channeling the Open Innovation efforts by:

- Creating an internal incubator

- Outbounding or incubating spin-offs

- Engaging in joint ventures and similar initiatives with companies from other industries (i.e. for understanding what 'moves' shared customers)

- Open Innovation focuses on both incremental and radical innovations.

- First run the Open Innovation platform as pilot program, to test success and re-adjust for a later higher-scale adaptation.

- Open Innovation broker that helps identifying the potential partners or sources for O.I.

- Partnering strategy for finding coupling and intersection of internal know-how with know-how from other non-core knowledge domains/competences, in order to produce more radical ideas..

- Partnering with start-ups and other small organizations, via an Incubator/venture

- Paying special attention to legal IP implications.

- Teaming up with external cross-industry network/organization (i.e. "Co-society")

Dimensions addressed: Participation (internal stakeholders, external stakeholders), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To make higher use of external capabilities to complement the internal ones, by means of multiple Open Innovation activities.

Best Practice 31: Instilling a more entrepreneurial and risk-taking culture, by means of:

- Stimulating internal stakeholders to participate or submit ideas for incubators

- Creating an internal venture/spin off for the projects with higher risk.

- Stimulate workers to launch ventures "and providing them the necessary resources and tutoring, by means of venture incubator".

- Establishing a solid funding scheme for seeding internal and external ventures which are either of traditional nature or online-based.

Dimensions addressed: Participation (internal stakeholders,), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To have a corporate culture that facilitates innovativeness, by means of a more entrepreneurial approach by the internal stakeholders

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Best Practice 32: Creating an innovation department that plays an active role in the innovation process as inspirator or facilitator, by:

- Coordinating involved departments

- Mitigating bureaucracy

- Coordinating collaboration with external partners and co-creation

- Providing and train on methodologies

- Active communication of innovation

- Ensuring alignment of innovation with company portfolio and strategy

Dimensions addressed: Participation (internal stakeholders, external stakeholders), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: Companies make use of a strong innovation department which is able to enhance participation of the different stakeholders and ensure that the innovation process is heading the right direction.

Best Practice 33: Integrating sustainability throughout innovation process at different stages, from strategic planning to evaluation and selection of ideas. This is ensured by for instance evaluating innovation's sustainability with must-meet check-lists or a panel of experts.

Dimensions addressed: Participation (internal stakeholders), Deliberation, Reflexivity, Responsiveness.

Stage of innovation process concerned: Innovation process overall.

Aim: To embed and ensure sustainability throughout the innovation process and organization, so that the innovation since its conception, not only complies with the regulations but also achieves a higher responsibility

Note that this list of best-practices is significantly comprehensive, but still a selection of best practices. Further practices can be found in Appendixes ("Further best-practices"), especially concerning co-creation and open innovation activities.

Chapter Conclusions

In this section, it was noted that not all the reviewed "better" practices may be considered as "best" or adaptable to the case study. Furthermore, it was found a vast amount of best practices that can be adopted by the studied company, that ensure one or more of the Responsible Innovation dimensions, as well as different phases of the innovation process. These practices may be considered themselves as 'conclusions' extracted from the literature review and the empirical research carried out.

Chapter Summary

Hereby in this chapter, the 'best' practices were presented, selecting from the 'better' practices identified both at the literature review and at the empirical research. Firstly an overview of how these practices can be adapted was done. It was not carried out in detail, as this was elaborated in-depth in another component of the FIS project. Thereafter, these best practices are 'tagged' following the framework of analysis and the concerned stage of innovation process. The practices are shown with a practical orientation, so that they can be easily reviewed and adopted by firm managers, and they are further reasoned trying to explain which contribution or benefit they provide. The combination of the context adaptation considerations and these best-practices lead to the recommended action plan shown in Chapter 8. Managerial implications for the company.

Chapter 7
Conclusions & recommendations

Chapter 7. Conclusions and recommendations

The present document aims at bridging the existing gap of Responsible Innovation application at firm level, and specifically within the automotive OEMs sector. It responds to the increasing pressure that companies are experimenting for delivering innovative products by means an efficient and effective process while at the same time increasing its responsibleness, by means of embedding values and ethic principles within the process.

This is especially the case for industries such as the automotive sector, which constantly suffer dwelling benefits, as well as multi-dimensional pressure from regulatory bodies, customers and competitors. Notably, increased societal or governmental concerns over sustainability. This has been found to be very relevant for the studied Spanish car manufacturer SEAT. In this context, Responsible Innovation can play a differentiator role, particularly nowadays that customers have a much higher awareness of responsibility concerning, notably but only, environmental sustainability.

Hence, the aim of the thesis is to complement the existing body of knowledge regarding responsible 'product innovation' processes, placing particular emphasis on areas which are still less explored in the literature, such as the application at firm level of Responsible Innovation, and its integration with emerging innovation approaches such as Open Innovation and Co-creation. Furthermore, it has aimed at adapting this knowledge to the automotive industry, which also presented a remarkably low amount of publicly-available information concerning application of the aforementioned approaches.

Overall, this knowledge has been translated into a managerially-applicable set of best-practices, covering the multiple dimensions of Responsible Innovation, practices that have been extracted and filtered by means of both literature review and a cross-industry benchmarking procedure.

In order to do so, an exploratory study was carried out, trying to understand why the leading firms from different industries managed to excel in innovation. This allowed finding some common patterns, as well as uncovering some practices which may have not been yet applied by other industries, but may well still be perfectly valid and suitable for them.

For selecting these 'leaders', or so-called best-in-class firms, a set of criteria had to be defined. It was found that perceived innovativeness (i.e. through consultancy firms and business magazines rankings)

was a highly-practical yet still sufficiently-solid tool. Additionally, the corporate culture (i.e. hierarchical structure), the highly competitive external competitive environment, the R&D intensity, the product complexity, the reputation for responsible practices and inevitably also accessibility of contacts within the firms proved as the key factors for selecting the studied firms.

The innovation practices were analyzed on the basis of a framework rooted by the key dimensions of Responsible Innovation, as it was found out to be a sufficiently clear structure, while at the same time generalizable across industries. These dimensions, and the entire concept of Responsible Innovation, are still further evolving in the scientific literature, but can be considered as a solid starting point for application at firm level. It has been found that the dimensions and values that form the framework of analysis are still not embodied explicitly within most of the companies' corporate culture, but are in many aspects significantly incorporated implicitly.

A large number of the extracted conclusions can be framed as recommendations, given its best-practices study nature, and therefore presented seamlessly rather than as two well-separated entities. Recommendations issued here are both at academic level and firm-oriented. With regards to academic, it is especially recommended to further explore applications of Responsible Innovation within the business environment. This will be further expanded in 'Chapter 9. Limitations and further research'.

With regards to those for the managers of the studied firm, it is strongly encouraged to adapt and adopt the best practices elaborated in 'Chapter 6. Best-practices framework', which have been extracted and formulated with a practical orientation, in order to enable firm managers to easily learn and adapt from them. Additionally, an action plan for the case study firm can be found in 'Chapter 8. Managerial implications for the company'.

Firstly, overall what has become evident both through the literature review and the data collection of this study is that some aspects are fundamental to achieve an effective innovation process, yet they are still far from fully adopted by all companies. For instance, one of the key factors is the use of cross-functional teams since the first stages of the process, as vital for a sufficiently-enriched and efficient innovation process. This enhancement of participation democratizes the process, making internal stakeholders more engaged, and therefore increasing the number of ideas as well as the success of the internal propelling of the idea throughout the innovation process.

In order to adequately address anticipation of future socio-technical trends and its impact on the company's product range, it was found that the most suitable methodologies were well-proven systematic methodologies such as for instance portfolio management and scenario analysis. However the outcomes of this anticipation, as well as how they were reached, have to be extensively communicated internally in order to increase acceptance among stakeholders.

Furthermore, it was found that having a specific innovation department was widely adopted among best-in-class firms, and of key relevance for the innovation process success. This department should, in order to enhance the participation of stakeholders and the effectiveness of the deliberation process, have an 'inspirator' and 'facilitator' role. For achieving this, it provides the necessary tools for deliberation to the different R&D units, breaks up the 'silos' and therefore stimulates inter-departmental collaboration, has some access to the budget allocation, and reports directly to the top management.

It was also found that two other supporting pillars for enhancing the innovation process were communication and incentives. Concerning the latter, it was found that managers majoritarily perceive that internal and external contributors should be rewarded especially with non-financial incentives, to increase attractiveness and sense of recognition and therefore increase motivation to participate. On the other hand, financial incentives were clearly less favoured and considered less effective.

Communication is especially relevant for participation stimulation. It has been suggested to increase its effectiveness by promoting more unconventional approaches. For instance, by means of carrying it out within new context or new methods.

Additionally, relating to the participation, active top management support was found to be of vital importance. Otherwise lower ranked workers are set to be reluctant to engage in the propelling of innovations, fearing for their own careers or simply seeing no positive outcome to their efforts.

Opening the organization to the external stakeholders is becoming an unavoidable trend, be it customers, or be it other groups such as universities or even competitors. This allows to cover all the five dimensions of Responsible Innovation, that is: Anticipation (as consulting external stakeholders, such as panel experts enriches the views of the future estimation and potential outcomes), participation, deliberation (providing a deeper understanding and enriched forethought process), responsiveness (allowing to react more rapidly and holistically to the interactions and effects among stakeholders) and reflexivity (again, due to a more enriched perspective).

Voice-of-customer was found to be of special relevance in order to achieve innovations which match the customers' values and are then societally accepted. This had to be done in ways beyond conventional marketing techniques, by means of actively involving R&D staff in the process since the very early stages of the process. A promising approach for this is Co-creation.

Another crucial factor that was found to enhance the innovation process was stimulating a more open corporate culture, in which employees are encouraged to be more proactive and risk-taking, more entrepreneurial. This is reinforced by providing supporting tools and structures, such as for instance incubators or venture capital.

Overall, it can be stated that the formulated framework should prove to reasonably be an easily-understandable and adoptable approach for firm managers to incorporate the different components of Responsible Innovation. It encompasses them in a 'language' that is close to what most managers usually deal with. Nevertheless, framing it 'chronologically' (that is, following the stages of the innovation process) can be a more suitable first approach for them, and therefore the solution adopted for Chapter 8. Managerial implications for the company. Furthermore, this cross-industry benchmarking provides to managers with reference points and shows the feasibility of application of the Responsible Innovation components to their business, and within a reasonable timeframe.

Chapter 8
Managerial implications for the company

Chapter 8. Managerial implications for the company

Hereby are enlisted recommendations, within the FIS framework, for the company to carry out an action plan. They are based on the best-practices framework, the previous diagnosis, the company's context and SWOT analysis, as well as a STEEP analysis of the overall socio-technical context. The SWOT and STEEP analysis are not included in detail in this thesis, given that they belong to another component of the FIS project, but the SWOT analysis is schematically overviewed in the Appendix ("SWOT analysis").

These recommendations are structured in a way that was found to be more accessible for the company's managers to interiorize. That is, by means of the 'chronological' steps of the innovation process. Therefore, the practices will be enlisted within each stage if they only touch one of them, or within 'overall innovation process' if they affect more than one of the stages.

a. Innovation process overall

a.1. Concerning the leadership roles:

- Create the figure of 'innovation challenge owner'. Rotate the person in charge of this year every year or two.
- Empower the innovation challenge owners with management support, visibility across the organization and freedom to choose how to accomplish the objectives established
- Engage management in coaching innovative teams/people
- Engage management in ceremonies and events for rewarding innovation activities
- Communicate to leaders that they should:
  - Ensure that rewards are related to the idea's creator
  - Ensure the traceability of ideas
  - Motivate for sharing and appreciating ideas

a.2. Considering the resources needed or deployed:

- Create and communicate the existence of an innovation toolbox and of open and responsible innovation practices
- Define annually a budget for the innovation activities according to the innovation objectives:

- o   Allocate budget for training, workshops and expert seminars on innovation methodologies, processes and management
- o   Coordinate the innovation budget with the Product Management department so that it is considered within the PR
- Create 'innovation cards' for every innovation. Cards should storage information about:
  - o   the value proposition and technologies
  - o   the evaluation against simple criteria (potential demand, selling price, cost of the solution/technologies, etc) which help you reviewing ideas fast and objectively
- Seek to develop partnerships for the exploration and development of fast evolving technologies and urban mobility solutions
- Create an internally universal accessible repository of new and evaluated ideas

a.3. Concerning the tools or methods:

- Organize regularly events for the collection and evaluation of ideas/innovations which reinforce the strategic arenas
- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas (the different activities are detailed in each phase)
- Create a wide database of SEAT employees who will be engaged in the evaluation and detailing of ideas and prototypes
- Create internal cross-functional teams in charge of the evaluation and detailing of ideas as well as of the development of immature innovations
- Use virtual platforms and/or adopt IT solutions (software or intranet) for the gathering, evaluation and detailing of ideas
- Create groups of external stakeholders for the evaluation and detailing of ideas as well as of the development of innovations

a.4. Concerning the communication:

- Make regularly meetings and workshops to communicate to the internal stakeholders:
  - o   who are the challenge owners
  - o   how the innovation process works. "Be inspiring!"
- Publish newsletters to inform about innovation activities, awards, challenges. Use attractive, unconventional ways of communication.
- Codify the activities of the innovation challenge owners and ambassadors:
  - o   which activities are done and how they are done

- o which results are generated and lessons learned

- o organize hand-shake meetings to transfer this information between teams

- Communicate to advanced research division the challenges and engagement it to overcome them

- Communicate to universities the challenges in which they can contribute with ideas:

  - o Joint effort of the R&D department and Human Resources in visits to universities and explain to researchers/students how SEAT innovates and its innovation challenges.

  - o Organize these visits regularly.

- Participate in innovation forums to explain SEAT's innovation model and engage external stakeholders (innovators, start-ups, companies from other industries…) in innovation activities.

- Work closer with commercial departments in charge of emerging markets and after sales

a.5. Concerning strategic orientation:

- Organize systematically 'supplier days':

  - o Invite tiers 1 and 2, as well as non-formal suppliers, to show their ideas related to SEAT specific challenges and strategic arenas

  - o Gather information about value propositions, cost of solutions, etc. in an structured manner.

  - o Evaluate the most promising ideas/solutions Give feedback to the suppliers about the potential barriers for the adoption of ideas

- Identify the main public funds and aids that can support innovation projects and training activities

a.6. Concerning general measures to improve the overall innovation process:

- Engage all relevant departments (R&D, Marketing, Sales, Product Management, Purchasing,…) in the definition of the strategic arenas and innovation challenges.

- Adopt portfolio management methods for strategic decision-making (e.g. to identify which strategic arenas need of ideation activities to be further developed)

- Define a stage-gate process with criteria that are clear and agreed with management. Communicate the process intensively and:

  - o Use incentives for idea generation activities

  - o Create processes for evaluating and detailing ideas which facilitate learning and experimentation

  - o Establish an incubator stage for developing promising technologies when they are not ready for industrial development and implementation.

- Seek to develop innovations which provide clear values to customers. Prioritize low-cost solutions which do not compromise quality, usability and sustainability
- Collaborate and engage other brands of the consortium, notably those from similar product range (VW and Skoda), from the earliest stage of the innovation process for achieving economies of scale

a.7. Concerning the role and responsibilities of the innovation department:

- Train the innovation department members on innovation:
    - methodologies
    - tools
    - processes
    - best-practices on innovation approaches
- Hire professionals with experience in innovation management and processes
- Engage, when possible, with social scientists: ethnographers, psychologists,… in order to get other perspectives and customer insights
- Create a map of consultancy, social media marketing and creativity-enhancing companies. Meet them and learn which are their capabilities and how they can support SEAT and its innovation process

b. Future strategic orientation

b.1. Concerning the leadership roles:

- Engage management and employees in the definition of strategic arenas and innovation challenges (and objectives related to them) once every 3-4 years

b.2. Concerning the tools or methods:

- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas, making a plan of activities based on the innovation challenges and strategic arenas

b.3. Concerning the communication:

- Make regularly meetings and workshops to communicate to the internal stakeholders the innovation challenges and strategic arenas

b.4. Concerning strategic orientation:

- Definition of the strategic arenas and innovation challenges every 3 years. Prioritize them so that there is a list of 6-9 themes maximum.
- For the definition of the strategic arenas and innovation challenges:
  - Collect and analyze the information on market, customer, economic, political, technology and environmental trends generated by the Market and Customer research departments
  - Collect fresh, customer insights by using, for example, design thinking, customer experience and empathic design methodologies.
  - Develop foresight activities
  - Collect and analyze information from car dealers and importers

c. Idea generation

c.1. Concerning the leadership roles:

- Work with the innovation challenge owners to organize activities for the generation of new ideas to overcome the challenge.

c.2. Concerning the tools or methods:

- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas for bringing external experts when needed for enhancing creativity.

c.3. Concerning the communication:

- Reward innovative teams/people who suggest and/or develop innovative ideas, whether they are or not implemented

c.4. Concerning strategic orientation:

- Use open innovation intermediaries or brokers for anonymously searching for innovative ideas and solutions to the challenges

d. Idea evaluation

d.1. Concerning the leadership roles:

- Work with the innovation challenge owners to evaluate ideas related to his/her area of expertise
- Work with the innovation challenge owners to organize activities for the evaluation of new ideas to overcome the challenge.

- Engage top-management regularly (every 3-4 months) on the evaluation of innovation activities and results

d.2. Concerning the tools or methods:

- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas, meeting regularly with idea's proponents and innovation challenge owners to evaluate ideas
- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas for bringing external experts when needed for facilitating the evaluation process.

e. Idea detailing

e.1. Concerning the leadership roles:

- Work with the innovation challenge owners to help detailing ideas related to his/her area of expertise

e.2. Considering the resources needed or deployed:

- Use a reduced budget for the detailing and prototyping of ideas

e.3 Concerning the tools or methods:

- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas, meeting regularly with idea's proponents and innovation challenge owners to detail ideas
- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas for bringing external experts when needed for facilitating the detailing process.
- Use the existing cross-functional committee as a platform for the evaluation and detailing of ideas for facilitating rapid prototyping and the testing of ideas. Iterate them according to feedbacks

e.4. Concerning strategic orientation:

- From the innovation challenge owner, collect regularly information regarding predevelopments and modules available in the consortium which support the strategic arenas

f. Idea selection

Recommendations for this phase have been listed already in the 'overall innovation process' section, as they usually affect other phases too (i.e. idea evaluation and idea selection, both being decision-making gates, share many commonalities).

g. *Innovation development*

g.1. Considering the resources needed or deployed:

- Allocate resources (budget) for the development of innovations that clearly strengthen the innovation portfolio

g.2. Concerning the tools or methods:

- Offer to innovators a physical place within the company and support them with methodologies (the innovation toolbox), guidance, networking and other resources needed for the development of innovation.

h. *Innovation implementation*

For this stage, no specific and isolated recommendations are listed, given than the studied placed higher emphasis on the previous phases of the innovation process, and it was found in the diagnosis that SEAT does perform in a sufficiently strong manner in this final phase.

Chapter Summary

In this chapter, the action plan was proposed, based on the best-practices of Chapter 6. Best-practices framework, as well as the firm's contextual analysis (general industry and firm-specific context, STEEP analysis and SWOT analysis). These measures for action have been structured following the innovation process phases in order to make it more easily understandable to the company's managers.

Chapter 9. Limitations and further research

A.   Limitations

Regarding the scope of the thesis, It is worth noting that the scope of the thesis is nevertheless quite broad, but the main limitations can be summarized as:

- Aiming to analyze only practices attaining, or connected to, the dimensions of Responsible Innovation rather than the entire set of managerial practices for innovation processes.

- Focusing only on product innovations, not on service innovations or process innovations.

- Focusing only on firm level, not policy or innovation system level.

- Focusing only on private firms, not on public firms or institutions.

- Placing its emphasis on the ideation and development phases, while the final stage of the innovation process (implementation for commercialization of the innovation) is given a clearly lower weight.

The research's unit of analysis is at firm level, not industry or nation level, and on external benchmarking, not internal. That is, comparing SEAT with other firms, not a comparison between departments within SEAT.

The centre of analysis, as a case study, was only handful firms, with special focus on one. It is not aimed at gathering a vast amount of companies and industries, as other studies have done before (Griffin 1997, Cooper 2002), but instead on deeper understanding of a small sample. Therefore, there is clear scope for further expanding the body knowledge by extending the study to other firms and industries. Time constraints and the nature of the research demand have played a significant role in these limitations.

Furthermore, the research scope focuses on the product innovation, not the sales/marketing, services or production processes. This was decided on the basis of the relevance and current demand from the centric firm of the study. However, there is scope at a later stage to expand it to the study of services, which is touted as an emerging business area with significant future potential for this automotive company. On the other hand, focus on sales/marketing or on production process does not seem recommendable, given already significant ongoing effort and solid know-how is in place, even within this firm.

Concerning the methodology, it has to be noted that, as is the case in many of the managerial practices empirical studies, the extracted data is based on perceptions, not on objectifiable observations. That is, the data is collected through the surveys and interviews in which the interviewees express their point of view, their perspective, which can always differ from the objective reality of the working procedures in the company.

Finally, since not all car manufacturers will be studied, some of the conclusions derived may be firm context-specific. While special attention was paid at the adaptation to the firm's context, there is room for a more solid validation. For a more comprehensive and broader understanding, across the entire automotive industry, further analysis after the end of this thesis project is encouraged.

B.   Reflection and further research

As inferred from the literature review carried out for this study, there is an existing solid body of knowledge concerning best practices of 'conventional' innovation processes. However, it has been detected a number of gaps towards achieving a desired state of "fully" responsible innovation process.

Firstly, Responsible Innovation is an approach still evolving and being developed at its theoretical level and framework. There are still differing definitions and views of the concept. For instance, for this study the definition by (Singh 2012) was selected, but there are other partly-conflicting views. It is also a concept still contested by some critics and no overall consensus has been reached to the date, as mentioned for instance in (Owen 2013).

Secondly, Responsible Innovation has focused mostly at policy or academic level, while at business level the adoption by firms is still limited. Therefore there is still major room for enlarging the knowledge base on application of more 'avant-garde' approaches to the level firm, notably a holistic application of Responsible Innovation, as well as its interlacing with other emerging approaches such as Open Innovation and Co-creation.

Consequently, we encourage furthering deepening the body of knowledge regarding the application of Responsible Innovation to the industry at firm level, and specifically to the transport industry. While this study has already pointed towards that direction, there is still major scope for increasing it, given the relatively short timeframe in which this study was carried out.

It was found that benchmarking is indeed a suitable methodology for analyzing innovation processes, and with careful adoption, it can become a powerfool tool for enhancing cross-company learning for Responsible Innovation at firm level. Nevertheless, it is worth noting that from the experience of this thesis, the most crucial aspect is to create a solid questionnaire (for survey and for interviews) based on a solid framework of analysis. That given, the rest of main components (namely company selection, interviewing and analysis) should fall in place.

Therefore further research should also go in the direction of encompassing a larger sample of companies, of types of industries, of number of respondents per company and of extension throughout time. It can also aim to further smooth the integration and combination of 'traditional' managerial best-practices (such as those from Robert G. Cooper) with those from responsible innovation.

As own contribution the following points can be highlighted:

- Expanding body of knowledge on the still scarce adoption of Responsible Innovation at firm level.
- Developing a benchmarking framework for innovation processes which can be easily replicated and molded.
- Allow cross-industry learning, by means of uncovering innovation-related practices which may be present so far only at certain industries but may be valid for others.
- Trying to increase the understanding of which emerging innovations practices such as Responsible Innovation, as well as Open Innovation and Co-creation are still heterogeneously adopted.

For the analyzed company, it is recommended to start deploying the action plan for implementation of the aforementioned best practices, and to maintain the momentum of the benchmarking process. This implies continuing the engagement on cross-industry partnerships and interviews, making this process as a well-established continuous process embedded with the company's innovation culture rather than as an isolated 'one-off' initiative. This could even entail engaging in a formalized network for sharing practices among different industries, hopefully leading to a win-win situation, mutually enriching innovation culture knowledge, which could also co-laterally lead to Open Innovation collaborations.

While the company still has a long road ahead for fully implement all the suggested practices, let alone making Responsible Innovation as its backbone, already some elements and practices were already in place within the company and only need moderate strengthening. Nevertheless the company managers should be careful not fall in the self-complacency trap. There is in fact still lot of room for improvement, and this improvement process should be continuous and consistent.

 Furthermore, it was perceived a positive and strong interest by their managers to progressively adapt this process. This is a very critical point. And it needs to be further extended higher in the hierarchy, securing top management's full support, as otherwise all attempts will remain only marginally successful at best.

Finally, as a personal reflection, I have found this study, and the topic in general, as both thrilling and comprehensive. There is still significant room for further deepening my knowledge and experience on it, and it is very likely that the topic will quickly gain higher attention and societal relevance. Therefore,

it certainly seems desirable and suitable field for my personal interests and career. Finally, it has also been very enriching to be fortunate to meet and interview managers with a high position and ranking, which proved to be both insightful and good communications. Certainly many lessons were learned.

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Appendices

Appendices

A.   Glossary and terms

Terms from research question

Comparable industry implies that the industry characteristics regarding innovation processes are sufficiently similar to allow for extrapolation of lessons learnt from one industry to another. Detailed criteria for this selection will be defined at a later stage of the thesis.

High-tech industries. The term 'high-tech' was first coined in 1971 by (Metz 1971) and the (OECD 2011) "*identifies high-tech industries based on a comparison of industry R&D intensities, a calculation dividing R&D expenditure by industry sales*". Specifically, six industries are ranked as high-tech, relative to other non high-tech industries (NSF 2012). These are listed in the Appendixes.

The reasoning behind why it is high-tech industries that are selected: high-tech industries are regarded as currently having the edge for innovation process know-how; they share characteristics with the automotive industry, including high R&D intensity and currently a fast pace of (business and regulatory) environment change.

Mature markets are those that have *"reached a state of equilibrium marked by the absence of significant growth or innovation"* (Investowords 2012). *"An industry which has passed both the emerging and the growth phases of industry growth. Earnings and sales grow slower in mature industries than in growth and emerging industries. Mature industries are characterized by low price to earnings ratios (P/E) and high dividend yields"* (Investopedia 2012).

Product categories

Definitions extracted from: (Stanski 2009)

- "**New to the World products** (first of their kind and create an entirely new market)
- **New Product Lines** (not new on the market but new to the business)
- **Additions to existing product lines** (new items to the business, but they fit within an existing product line)
- **Improvements and revisions to existing products** (replacements of existing product lines)

- **Repositioning** (new applications for existing products)
- **Cost reductions** (the least "new" of all new product categories. Designated to replace existing product lines while providing similar benefits and performance but at significant lower costs to the business").

B.   Survey script

Section 1. Strategic orientation and Future analysis

Activities established prior to the generation of ideas, in which the organization defines which strategic approach it wants to follow and which are the market developments that will affect its product innovation needs. The purpose is the identification of innovation potentials and the formulation of specific innovation activities for the company.

Which activities does your management use for communicating the innovation's strategic challenges?

Tick all the options that apply

☐ Regular meetings

☐ Workshops

☐ Corporate statements

☐ Newsletter

☐ Others (specify) ☐

Which future-oriented methods does your company use for opportunity identification?

Tick all the options that apply.

☐ Delphi method

☐ Foresight / anticipation

☐ Scenario analysis

☐ Portfolio analysis

☐ Mega-trends

☐ Others *(specify)*

Your company runs online market intelligence for monitoring customer trends...

Select only one of the options

○ Directly

○ Outsourced (i.e. via a market research agency)

○ Does not use

2. Idea generation

The 'idea generation' stage refers to the activities, spontaneous or planned, that lead to the origination of an innovative idea.

For your company, how effective are the following sources of ideas...?

Rate only the sources that are used by your company

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)
R&D staff	○	○	○	○	○	○	○	○	○	○
Commercial staff (Marketing, Sales, etc)	○	○	○	○	○	○	○	○	○	○
Staff from Manufacturing, Purchasing and	○	○	○	○	○	○	○	○	○	○

other departments

Parent company   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Competitors   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Customer or user   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Crowdsourcing (groups or communities of users and/or experts)   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Suppliers   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Consultants   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Universities/Public research organizations   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Private research institutes   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Regulatory bodies (i.e. Environmental standards)   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Start-ups   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Companies working in other industries   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Incubators   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Others (specify)   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Which processes are used for involving internal stakeholders in the idea generation process?

Tick all the options that apply.

☐ Workshops

☐ Regular meetings

☐ Brainstorming sessions

☐ Web-based forum / intranet

☐ Incentive-based programs

☐ Ideas contests

☐ Idea generation clubs

☐ Crowdsourcing

☐ Clinics

☐ Ideation marathon

☐ Others (specify) _____

Which measures are used to promote participation and collaboration of external sources for the idea generation?

Tick all the options that apply.

☐ Economic rewards

☐ Explicit recognition

☐ Knowledge-sharing

☐ Business-sharing

☐ Licensing

☐ Alliances or partnerships

☐ Providing seed capital to start-ups

☐ Tutoring new ventures

☐ Holding shares in start-ups

☐ Web-based forums

☐ Financing university projects

☐ Others (specify) [   ]

What incentives and rewards are provided to idea generation's team members?

Rate the frequency of those incentives that are used by your company. (Leave blank those options that are not used).

	Never	Sometimes	Always
Project-based profit-sharing	○	○	○
Compensation time	○	○	○
Recognition in organization newsletters	○	○	○
Recognition at award dinners	○	○	○
Plaques, pins, project photographs	○	○	○
Project completion celebration lunches/dinners	○	○	○
Non-financial rewards chosen by the team (i.e. trips, family dinners)	○	○	○

Other financial rewards

(specify) ☐

Other non-financial

rewards (specify)

☐

Which methods for idea generation does your company use? How effective are they?

Rate numerically the effectiveness of those methods that are used by your company. (Leave blank those options that are not used).

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)
Suggestion box	○	○	○	○	○	○	○	○	○	○
Brainstorming sessions	○	○	○	○	○	○	○	○	○	○
Internal meetings with colleagues	○	○	○	○	○	○	○	○	○	○
TRIZ method	○	○	○	○	○	○	○	○	○	○
Reverse engineering	○	○	○	○	○	○	○	○	○	○
Workshops	○	○	○	○	○	○	○	○	○	○
Competitive intelligence analysis	○	○	○	○	○	○	○	○	○	○

Quality Function Deployment methods	○	○	○	○	○	○	○	○	○	○
Crowdsourcing	○	○	○	○	○	○	○	○	○	○
Focus groups with potential users	○	○	○	○	○	○	○	○	○	○
Scenario analysis	○	○	○	○	○	○	○	○	○	○
Web scouting	○	○	○	○	○	○	○	○	○	○
Lead users	○	○	○	○	○	○	○	○	○	○
Empathic design	○	○	○	○	○	○	○	○	○	○
Contests	○	○	○	○	○	○	○	○	○	○
Others *(specify)*	○	○	○	○	○	○	○	○	○	○

For idea generation, the main focus of your company's Co-creation platform is on...

Select only one of the options

(Leave blank if your company does not use any Co-creation platform)

○ Solving existing specific problems

○ New ideas in general

○ Both equally

Co-creation provides your company more effective results for innovations that focus

on...

Select only one of the options

(Leave blank if your company does not use any Co-creation platform)

Exploitation *(Innovations focused on enhancing current business or products of the company)*

Exploration *(Innovations focused on business or product areas new to the current company focus)*

Both of them equally

Your company runs the Co-creation platform / innovation 'marketplace'...

Select only one of the options

(leave blank if your company does not use any Co-creation platform)

Directly

Outsourced to specialized marketing companies

Via independent websites *(such as InnoCentive, NineSigma…)*

3. Idea evaluation

Activities related to the initial assessment of gathered innovative ideas.

In your opinion, the following criteria are sufficiently assessed during your company's innovation process...

Reflect on the assessment of those criteria that are used by your company. (Leave blank those options that are not used).

	Strongly disagree	Moderately disagree	Neither agree	Moderately agree	Strongly agree

nor

disagree

Impact on environment *(environmental sustainability)*	○	○	○	○	○
Societal impact as a whole *(social sustainability)*	○	○	○	○	○
Affordability *(economic sustainability)*	○	○	○	○	○
Cooperativeness	○	○	○	○	○
Transparency	○	○	○	○	○
Safety	○	○	○	○	○
Autonomy	○	○	○	○	○
Accountability	○	○	○	○	○
Sense of ownership	○	○	○	○	○
Community	○	○	○	○	○
Universal usability	○	○	○	○	○
Cultural differences between regions	○	○	○	○	○

Trust

For the idea generation and evaluation stages, your company's Co-creation platform with users focuses on...?

Select only one of the options
(Leave blank if your company does not use any Co-creation platform)

○ Broadness *(superficial data from large sample and range of users)*

○ Deepness *(insightful data from reduced sample and range of users)*

○ Intermediate compromise between them

4. Idea detailing (pre-development)

Development of the evaluated ideas into product concepts. This stage ends when product concepts are presented to decision-making units for selecting the ones that will get resources to be further developed.

In your opinion, customers of the company actively participate in the definition of attributes and technical features of the product...

○ Strongly disagree

○ Moderately disagree

○ Neither agree nor disagree

○ Moderately agree

○ Strongly agree

Does your company use an open-source platform?

○ Yes

○ No

5. Idea selection

During the idea selection, product concepts are evaluated by decision-making units which would decide whether the innovation gets resources for further development or it is discarded

Which decision-making support tools does your company use for the stages of...?

Tick all the options that apply. Each column represents one different stage.

	Idea evaluation	Idea selection
Portfolio analysis	☐	☐
Cost-benefit analysis	☐	☐
Scoring models	☐	☐
Competitor analysis	☐	☐
Expert evaluation	☐	☐
Workshops	☐	☐
Online surveys	☐	☐
Customer online forums	☐	☐
Check-lists of 'must meet' and 'should meet' criteria	☐	☐
Advisory programs supported by R&D and marketing staff	☐	☐
Web-based platforms	☐	☐
Others *(specify)*	☐	☐

How would you rate the effectiveness of the following tools?

Rate numerically **only if** *used*

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)
Portfolio analysis	○	○	○	○	○	○	○	○	○	○
Cost-benefit analysis	○	○	○	○	○	○	○	○	○	○
Scoring models	○	○	○	○	○	○	○	○	○	○
Competitor analysis	○	○	○	○	○	○	○	○	○	○
Expert evaluation	○	○	○	○	○	○	○	○	○	○
Workshops	○	○	○	○	○	○	○	○	○	○
Online surveys	○	○	○	○	○	○	○	○	○	○
Customer online forums	○	○	○	○	○	○	○	○	○	○
Check-lists of 'must meet' and 'should meet' criteria	○	○	○	○	○	○	○	○	○	○
Advisory programs	○	○	○	○	○	○	○	○	○	○

supported by

R&D and

marketing staff

Web-based

platforms

Others *(specify)*

6. Development of innovations

The adoption or development of innovation includes all the time spent on the product concept development once the innovation has been selected.

In your opinion, your company has a well-defined process for informing ideas' submitters about the status of the submitted idea...

○ Strongly disagree

○ Moderately disagree

○ Neither agree nor disagree

○ Moderately agree

○ Strongly agree

Does your company make a formalization of the 'idea champion' figure/role?

* Idea champion or Innovation champion: Individual who takes an innovation and actively and enthusiastically promote the idea, build support, overcome resistance and ensure that the idea is implemented.

○ Yes

○ No

Does your company organize offline workshops and events with customers, such as contests/competitions, for engaging in concept development?

○ Yes

○ No

In your opinion, your company's users make significant development contributions in an 'online design environment'?

Leave blank if your company does not use an 'online design environment'

○ Strongly disagree

○ Moderately disagree

○ Neither agree nor disagree

○ Moderately agree

○ Strongly agree

Which procedures does your company use for enhancing participation of (internal and/or external) stakeholders in...?

Tick all the options that apply. Each column represents one different stage.

	Idea detailing	Innovation development
Crowdsourcing community	☐	☐
Contests	☐	☐
Primary market research	☐	☐
Workshops	☐	☐
Incentive-based programs	☐	☐

Online and offline product testing	☐	☐
Mass customization	☐	☐
Beta testing	☐	☐
TRIZ method	☐	☐
Quality Function Deployment	☐	☐
Conjoint analysis	☐	☐
Focus groups	☐	☐
Virtual teams for development of concepts	☐	☐
Others *(specify)*	☐	☐

How would you rate the effectiveness of the following procedures?

Rate **only** if *used.*

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)
Crowdsourcing community	○	○	○	○	○	○	○	○	○	○
Contests	○	○	○	○	○	○	○	○	○	○
Primary market research	○	○	○	○	○	○	○	○	○	○
Workshops	○	○	○	○	○	○	○	○	○	○

Incentive-based programs

Online and offline product testing

Mass customization

Beta testing

TRIZ method

Quality Function Deployment

Conjoint analysis

Focus groups

Virtual teams for development of concepts

Others *(specify)*

7. Implementation of innovations for commercialization

This stage refers to the activities for preparing the production and marketing of the product. Therefore, it includes the production, market introduction and penetration of the new product or innovation.

Which of the following activities does your company use for leveraging external

innovations (inbound Open Innovation)? How effective are they?

Rate the effectiveness of all those that apply to your case. If none applies, leave blank.

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)
In-licensing	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Alliances and other collaborative research projects	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Acquisitions	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Venture investments	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙
Others (specify) [_____]	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙

Which of the following activities does your company use for leveraging innovations that would be otherwise internally abandoned (outbound Open Innovation)? How effective are they?

Rate the effectiveness of all those that apply to your case. If none applies, leave blank.

	1 (extremely ineffective)	2	3	4	5	6	7	8	9	10 (extremely effective)

Out-licensing   ○   ○ ○ ○ ○ ○ ○ ○ ○   ○

Spin-offs   ○   ○ ○ ○ ○ ○ ○ ○   ○

Joint ventures   ○   ○ ○ ○ ○ ○ ○ ○   ○

Strategic
alliances   ○   ○ ○ ○ ○ ○ ○ ○   ○

Others (specify)

[_____]

8. Leadership and Organization structure

How leadership and organizational culture affect the innovation process.

Who is usually the leader of the innovative projects?

Select the option that best describes the case of your company.

○ Innovation champions

○ Process/problem owners

○ Project managers

○ No one

○ Other *(specify)* [_____]

How are these leaders determined?

Select the option that best describes the case of your company.

○ Management appoints the leader

○ A person volunteers

○ Team members choose the leader

○ Peers choose the leader

○ Other (specify) [   ]

Which of the following best describes how the innovations are lead throughout the innovation process (from idea generation to innovation commercialization)?

○ Single leader throughout all process

○ Firstly an informal leader emerges (i.e. idea generator or idea champion), then a manager is appointed as formal leader to lead until the final

○ Leader changes multiple times throughout the process

○ Other (specify) [   ]

Your company's hierarchy is best described as...

○ Authority-based hierarchy

○ Consensus-based hierarchy

In order to implement Co-creation, which degree of organizational changes did your company carry out?

Select only one of the options
(leave blank if your company does not use any Co-creation platform)

○ A new specific Co-creation division was created

○ Marketing department adapted to lead the Co-creation management

○ R&D department adapted to lead the Co-creation management

○ Co-creation management is jointly lead by adapted Marketing and R&D departments

○ Structure and roles were not affected

9. Background

Finally, please fill in three questions regarding your background within the company.

Answering this section will NOT affect your anonymity and will be kept only the by the study's researchers.

Your position in the company is in...

○ Research & Development

○ Marketing

○ Finance

○ Corporate Management

○ Human Resources

○ Information Systems

○ Other (specify) [_____]

Your job classification is best described as...

○ Top management

○ Middle management

○ Core staff (e.g. engineer)

○ Administrative personnel

○ Other (specify) [_____]

You have worked for the company...

○ Less than 1 year

○ 1-2 years

- 3-5 years

- 6-9 years

- 10-15 years

- More than 15 years

C.   *Semi-structured interview script*

These are the questions that served as guidelines, but it was not intended to ask all questions to each respondent, and instead it adapted to the flow of the interview.

Phases of Innovation process

Stage 0: 'Strategic orientation and Future analysis'

- How do you identify plausible innovations opportunities?
- How do you prioritize different opportunities for innovation?

Stage 1: 'Generation, evaluation, detailing and selection of ideas'

- What is the strategy of your company for involving or participation of all relevant departments or teams in the ideation processes? How was this strategy be implemented?
- What is the strategy of your company for allowing the active participation of customers in ideation processes? How was this strategy implemented? Why is important the involvement of customers in ideation?
- What is the strategy of the company for enhancing the participation of external stakeholders (universities, partners, suppliers, etc) in ideation processes? How was this strategy implemented? *Why is important the participation of external stakeholders in ideation?*

1.1. Idea generation

- How do you *improve* the quality and quantity of ideas (generation)? *How do you promote the generation of as many as possible customer-centric ideas?*
- How do you *motivate* the *involvement* of the internal individuals in idea generation? How do you *communicate or encourage to managers and employees to* devote sufficient time to idea generation?
- Does hierarchical situation affect to ideation process? If yes, how do you deal with this situation?

1.2. Idea evaluation

- How do you *involve* internal stakeholders in the idea evaluation? Why?
- Do you *involve* external stakeholders in the idea evaluation? How and why?
- How do you assess the potential of the innovative idea?
- How do you consider sustainability of ideas? (environmental, social and economic)

1.3. Idea detailing (pre-development)

- Do you involve customers in the pre-development of ideas? Why? How do you motivate customers for participation?

- Do you make use of a co-creation platform for the idea pre-development? Why? How do you use it?

- Which are the external stakeholders whom you involve in the pre-development process? Why? How?

1.4. Idea selection

- How is the selection of ideas done? Who participates? Why?

- Do you involve customers in the idea selection? Why? How?

- Which are the main criteria and values that you consider for assessing the idea's potentiality?

Stage 2: 'Development of innovations'

- What is the strategy of the company for involving customers in innovation development? How company's innovation strategy caters or serve to customer's expectations and needs? How is this strategy implemented?

- What is the strategy of the company for involving other external stakeholders in innovation development? How is this strategy implemented?

Across phases

1. Open innovation

- In your opinion, have you fully implemented open innovation? How did you do it and which were the key challenges? *[Which cultural, procedure, skills, and motivation changes did it require?]*

- What capabilities a company needs to implement successful open innovation ?

- How do you decide which innovations to incorporate from external sources? And for inside-out innovations? (explain "inside-out")

- How do you decide which inbound and outbound open innovation methods to employ? *(methods = spin offs, licensing, joint ventures, strategic alliances, etc)*

2. Co-creation

- In your opinion, have you fully implemented co-creation? How did you do it and which were the key challenges? *(explain what co-creation means)*

- Which activities does your co-creation strategy involve?

- Who do you *involve* for implementing the co-creation tools? How?

3. Leadership & Organizational structure & Culture

- How do you empower the innovation champion or 'leader'?

- How do you improve cooperation between departments for innovation development?

- Do you try to *prevent* bureaucracy from slowing down innovative projects? How?

- Do you try to *prevent* the 'Not-invented-here' syndrome'? How?

- Do you *stimulate* a climate in which all individuals' inputs are heard? How?

- Which are the responsibilities and tasks of your 'innovation department'? How does it work?

D.   *Benchmarking conceptual model*

Deriving from meta-analysis of the hypothesis from key benchmarking-related papers (Pickering 1991, Cooper 1995, Delbridge 1995, Hariolf Grupp 1996, Drew 1997), a simplified conceptual model was created. Afterwards, a more detailed model, showing all the significant relationship and causal links, is presented.

The conceptual model revolves around the application of benchmarking, and therefore its conditions for successful application and the consequences derived from this implementation. There are two main components for the successful implementation of benchmarking: the first one external to the benchmarking itself, that is related to the (specific) conditions of the firm, and the second one intrinsic to the benchmarking methodology, that is for instance the type of benchmarking implemented. The outcomes of the successful implementation of benchmarking are the effects and changes on the firm. That is, improvements on the company's competitive performance, and other organizational transformations (i.e. change in culture or hierarchical structure) which may not directly lead to increased competitive performance but also have an impact on the firm's functioning (Drew 1997).
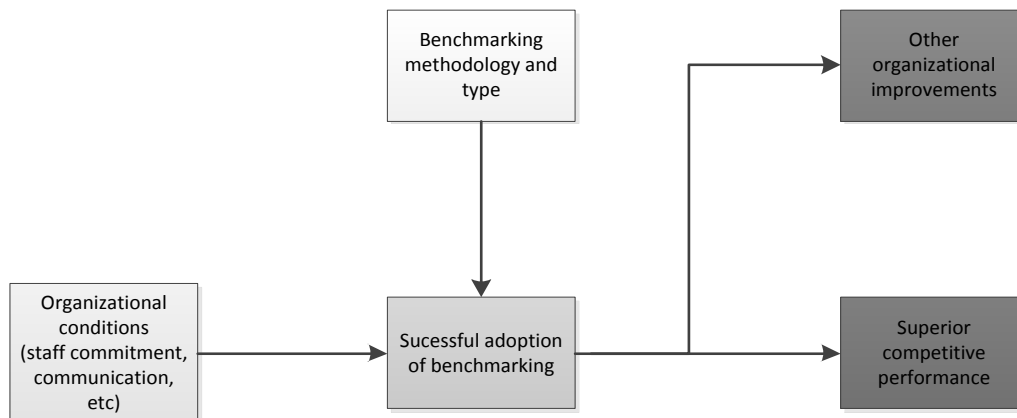
Fig. 51 Simplified benchmarking's conceptual model

Starting from already mentioned components, for the extended conceptual model it is necessary to enter into a deeper analysis and unbundling of the different dimensions. The main dimensions found in the literature for this firm-related component are: management commitment, staff commitment and involvement, and communication. These affect two critical factors for a correct implementation of benchmarking: resources available (human and financial) and resistance to change.

Added to this, a key role is played by the implementation methodology of the benchmarking framework. Some of the elements listed in the literature are: type of benchmarking, time limitation, partner finding, integration of benchmarking with budgeting, integration of benchmarking with strategic planning, integration of benchmarking with resource planning, stretch goals, strong tacit knowledge component, training programs and correct identification of benchmarking indicators. Furthermore, other aspects such as 'cost of imitation lower than cost of innovation' play a key role in the successful implementation of benchmarking.

The successful deployment of benchmarking allows elaborating a suitable best-practices code, from which innovation strategies are defined and implemented, helped by the fact that the performance gap identification yielded by the benchmarking leads to pressure for change. The results of this are: direct effects on the competitive performance and indirect effects (on the organization). The main variables of these outcomes are: organizational learning, revision of mental models, assumption's questioning, increase of organizational memory, enrichment of network of connections among individuals, improvement of cognitive capabilities (of individuals and of organization), idea enrichment, improvement of problem-solving, improvement of strategy-making process.
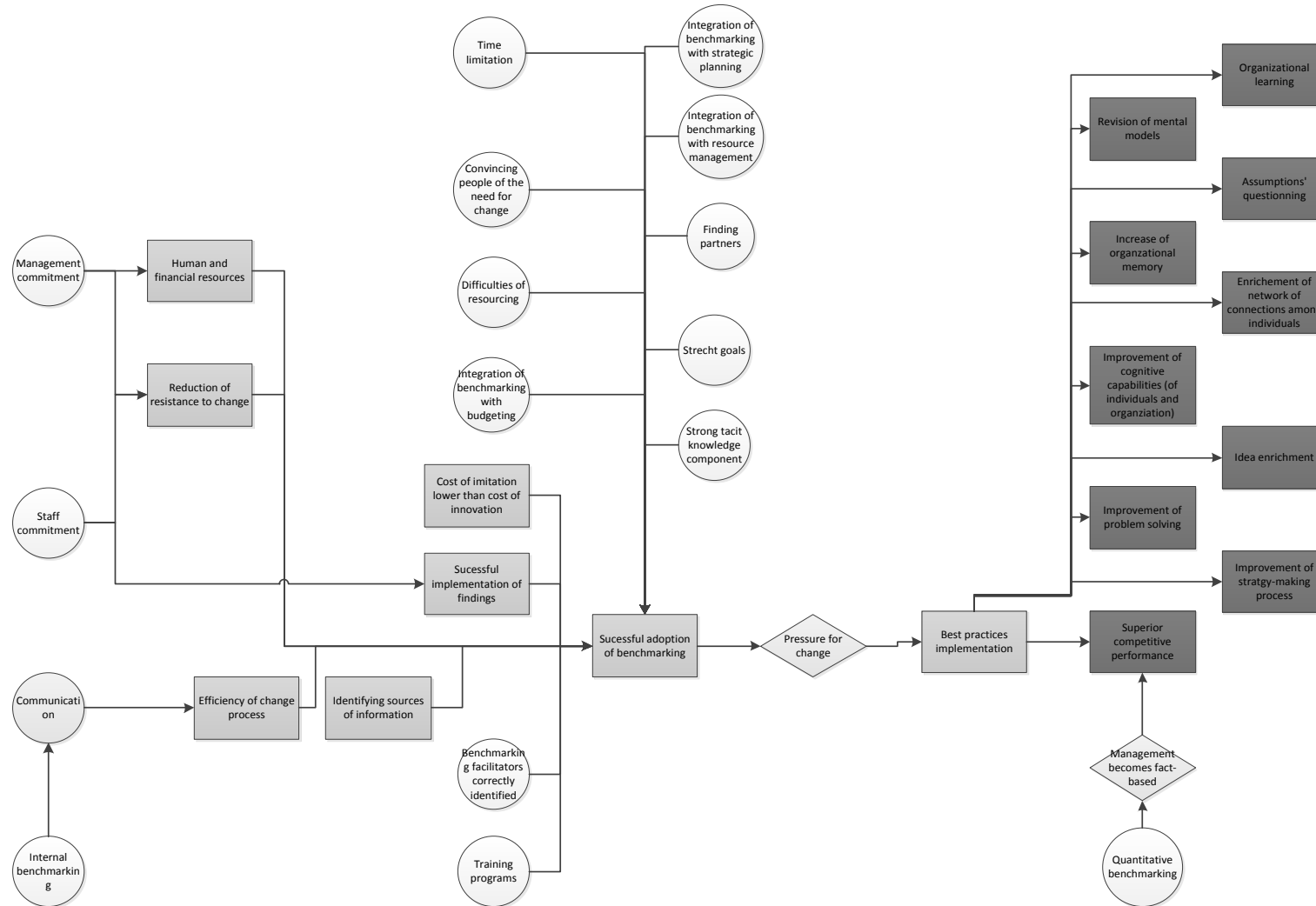
Fig. 52 Extended conceptual model

E.   *SWOT analysis*

Overview of the SWOT analysis for SEAT's status quo, elaborated by Abel Zahinos within the context of the FIS project.

Strengths	Weaknesses
- Access to information, knowledge and technologies from VW group - Formal processes for collecting/evaluating innovations from VW, formal suppliers and competitors - Strong in adopting relatively-developed innovations - Strong follower - Growth orientation	- Weak use of creativity and portfolio management methods - Skills, knowledge and training on innovation methodologies and processes - Communication of innovation objectives - Allocation of resources - Limited used of methods for engaging customers and other external stakeholders - Presence in emerging markets, i.e. BRIC markets
Opportunities	Threats
- Demand for safety, security in cars, higher comfort and low consumption technologies - Increasing demand for small segments (A0 to B) and cost-effective vehicles - Healthier and more active senior citizens become a potential target group - Connectivity and mobile- and online-services - New innovation approaches and methods for obtaining customer insights and technologies - VW teams supporting product and service innovation	- Loss of attractiveness of and restriction for the use of cars - Stronger competition from Asian manufacturers based on technology and low-cost - Economic situation, high unemployment and decreasing buying power in Europe - Empowered, rational and cautious customers - Stricter rules: safety, CO_2 and particles emissions, recycling and use of resources - Increasing competition in volume segments and affordable vehicles

F.   Further best-practices

These best-practices concern mainly those aimed at increasing participation of non-internal stakeholders, and therefore mostly derive from Open Innovation and Co-creation.

Co-creation platforms activities

Running 'ideas contests' channeled via the corporate website or via a specific website. Teaming up with specialized innovation-services firm may be the most suitable approach for starting this type of activities and running pilot programs. For full exploitation of its effectiveness, it is recommended to run it on a continuous basis rather than as a one-off, and especially to eventually lead to becoming a stable innovation community. (Viskari 2007)

Establishing a long-term innovation community is a more effective platform in the long run. These communities or Co-creation labs may not be only of customers, but also of researchers, and may be enhanced by elaboration of 'lessons learned' reports (Viskari 2007)

Below are listed the suggested action-oriented best-practices:

Provide consumer-customized information, for creating trust and commitment between firm and users. (Sawhney 2005)

Implementing forums within the corporate website or through 3rd parties such as InnoCentive, NineSigma or Yet2. (Sawhney 2005)

Realization of crowdsourcing initiatives such as contests, both with individuals or users, as well as with experts and companies. (Sawhney 2005)

As exemplified in the case of Ducati:

Engaging customers and experts in virtual communities is vital for new product concepts exploration. (Sawhney 2005)

Running technical forums for knowledge sharing and ad-hoc surveys. (Sawhney 2005)

For the back-end of the innovation and NPD processes, directly involve most active customers in both online and offline concept co-development. (Sawhney 2005)

Regularly introducing new contests and competitions. (Sawhney 2005)

At later stages, test the pre-selected product designs with a broader customer base, and even give the users some decision-making power. (Sawhney 2005)

Transition towards implementing Co-creation

Re-organization of departments is needed for proper Co-creation incorporation. For instance, re-organizing the entire marketing department around the community role, while keeping a close link to R&D (Sawhney 2005)

An alternative is to create a specifically-dedicated spin-off. (Sawhney 2005)

Creation of specific organizational roles devoted to customer Co-creation. (Sawhney 2005)

Engagement of all the company's product engineers in customer relationship management activities, even interviewing (in person) selected customers. (Sawhney 2005)

Designating community managers, for monitoring not only its own website, but also external relevant forums or even other 'lifestyle' websites, actively participating (anonymously or identifying themselves). (Sawhney 2005)

Customers actively heard on their feedback of layout and functions of company's website. (Sawhney 2005)

Having in place an incentive system adapted to the different participant profiles, providing financial or recognition rewards. (Sawhney 2005)

Modalities and partners for collaboration with external stakeholders (O.I.)

Establishing external contacts with experts and industrial contacts (even of different disciplines/fields/industries) can prove effective for sharing knowledge on trends and also methodologies. Even ask to science-fiction writers for understanding potential future scenarios.

Engaging in joint ventures and similar initiatives with companies from other industries can help understanding what 'moves' (shared) customers.

Use of Open Innovation approach for increasing the number of incremental and radical innovations.

Well-defined, structured process for handling ideas and a step-by-step implementation process for Open Innovation platform.

First run the Open Innovation platform as pilot program, to test success and re-adjust for a later higher-scale adaptation.

Run the aforementioned process with an Open Innovation broker that helps identifying the potential partners or sources for O.I. This broker is more flexible/adaptable to the company's requirements/needs (than for instance Innocentive).

Furthermore, this Open Innovation broker is also in charge of managing the relationships with the other involved parties/stakeholders and keeping HP's anonymity, in order to avoid 'alerting' competitors about their future strategy and aims.

Partnering strategy for finding coupling and intersection of internal know-how with know-how from other non-core knowledge domains/competences, in order to produce more radical ideas. This ideas are then internally incubated.

IT platform for gathering knowledge from outside, launching specific challenges/topics, in order to explore areas of non-core competences/knowledge domains (i.e. chemicals), as well as solving existing problems.

Partnering with start-ups and other small organizations, via an Incubator/venture to speed up the development of new businesses and products. This collaboration combines the benefits of big corporation and small organizations.

The biggest barrier for implementation of Open Innovation: Open Innovation needs careful exploration of legal IP implications.

Teaming up with external cross-industry network/organization ("Co-society") in order to co-innovate with companies from other industries, sharing information and experiences for co-development.

Active engagement of internal and external stakeholders since the early stages of the innovation process, that is, since idea generation. This should be achieved by means of multiple channels of communication (i.e. informal meetings, newsletters, workshop, etc) as well as platforms for 'democratizing' the innovation process (i.e. via anonymous idea-submission IT platform).

This will be further illustrated in the coming practices.

It has been detected, both through the literature and during the interviews, that an entrepreneurial spirit is crucial for achieving a higher level of innovativeness. Fortunately, this aspect is facilitated by the Open Innovation philosophy (for instance, rather than killing a non-core idea, Open Innovation offers to employees the possibility of launching a spin-off), but requires a set of practical measures. This can be:

Creating an internal venture/spin off for the projects with higher risk. (Viskari 2007)

Rather than abandoning a promising but highly uncertain idea which has already consumed resources, these can be continued by means of a protected space, such as especially-devoted venture, be it internal or be it taken outside of the company.

Stimulate workers to launch ventures "and providing them the necessary resources and tutoring, by means of venture incubator". (Viskari 2007)

Not only can the company promote the ventures, but they can also be promoted by individuals. But this too requires a protected space, with sufficient support and resources, in the form of incubator. While it can be resource consuming, it can also potentially yield high benefits.

Therefore, this requires the following best-practice.

Establishing a solid funding scheme for seeding internal and external ventures which are either of traditional nature or online-based. (Viskari 2007)

Extensive use of networks with universities and industrial partners, via for instance 'solution' labs, carrying out conferences and seminars, as well as scientific societies' meetings. (Viskari 2007)

Traditional closed innovation usually neglected this enriching and cost-effective source of ideas. Open Innovation embraces them, recognizing that they can lead to both shared risks and costs.

Openness for showing prototypes, internal methods and current research projects to external stakeholders, in order to establish collaborative climate for effective knowledge exchange. (Viskari 2007)

Nevertheless, it has to be conceded that this best-practice is not always suitable, especially in industries which have high secrecy concerns and R&D intensity, such as automotive industry.

Extensive use of joint ventures, as a good balance between sharing risk and harnessing the investment's returns. (Viskari 2007)

Joint ventures allow for risk-sharing, as well as mutually-enriching learning, and if satisfactory outcomes are reached, usually lead to expanding into alliances.

> Establishing own research centre within an academic institution, which also acts as incubator for start-ups. (Viskari 2007)

If sufficient resources are available, and the company has geographical or networking proximity with universities or research institutions, joining forces with them can provides cost-effective synergies. Furthermore it can prove a good source of talent recruitment.

> Ensuring exclusivity by engaging in contracts. (Viskari 2007)

This is because it can allow the company or institution to have a differentiate or prestige element, as for instance TU Vienna can claim with its partnership with BMW (Viskari 2007).

> Solid promise of long-term relationship. (Viskari 2007)

This implies engaging with suppliers (and other inbound innovation sources) in long-term term collaborative manner rather than on a sporadic or price-driven basis (for instance, as currently many car manufacturers communicate a set of specifications for a component and then selects the suppliers' solution which best fits the price-quality ratio). This allows for a better know-how flow, synergies and shared risk, as well as being able to jointly develop more complex projects.

> Providing direct financial incentive, for instance as percentage of the costs saved from using the innovation.(Viskari 2007)

This is especially important for the case of suppliers, and to a lesser extent also for customers.

> Create an institute responsible for searching and connect with key customers. (Viskari 2007)

Although not always suitable, this practice can prove to be an effective method, showing a strong commitment to harnessing this inbound source. This links with Co-creation, as it will be seen at a later section.

> Establishing development programs with companies and institutions, as well as core partnerships with suppliers. (Viskari 2007)

This is further in line with aforementioned best-practices, and aims to point out that all kinds of stakeholders should be considered as potential inbound sources, to which it is preferable to develop joint projects and programs.

Active acquisition (of i.e. start-ups) and investing strategy can be very effective… if enough financial strength is available. (Viskari 2007)

The aim is acquiring scarce intellectual assets. The criteria for green-light of acquisition can be: employee retention, follow-up on new product development and return on investment. Furthermore, consider companies with product on different lifecycle, and use scenario planning approach for decision-making support.

Sharing of improvements' information across licenses, for the core company to retain control and competitiveness. (Viskari 2007)

It has to be noted that this practice may not be suitable for all industries, as many can be too sensitive to this 'easy' information flow and show fierce resistance.

Active outbound licensing, even through online methods (own website or specific Co-creation websites). (Viskari 2007)

Also consider donating patents and know-how to universities or non-profit groups, for enhancing public relations (brand image-improving) and tax reductions. (Viskari 2007)

Open Innovation calls for a more aggressive and open-minded licensing approach, trying to seek new recipients and demand of know-how, and seeking new forms of benefits, not necessarily tangible or financial.

Going even one step further, by licensing core patents (certain period after commercialization) can be applied on certain cases. (Viskari 2007)

Not only licensing patents, but also know-how and trade secrets. In order to do so, run a licensing program, covering different types/size of clients/partners and flexibility of agreement types. (Viskari 2007)

Alternatively to patent licensing, another effective method to manage outbound of non-core technologies is forming strategic alliances and joint ventures with competitors (Viskari 2007)

Opening up unused or non-core patents to open-source can actually speed up development and later the companies can still harness part of its benefits, especially if the company still retains the role of coordinator of the open-source community. (Viskari 2007)

Transition towards implementing Open Innovation

Transition from closed to Open Innovation not only requires time and actions from the top management, but an entire company's corporate culture revamp. This implies creating a transition plan and taking actions in multiple dimensions (from leadership to entrepreneurial spirit and organizational structure, and even the deepest foundations of the company's approach and vision).

The main aspects for successful implementation of Open Innovation are:

Embedding Open Innovation within the company's DNA, in which all employees are participant (Wielens 2012).

Use of Open Innovation 'champions or ambassadors', both at top management and at lower ranks, and at each business unit (Wielens 2012).

Encouragement of employees to 'freely' engage into external contacts (Wielens 2012).

Building trust is therefore the base for successful collaborations with external partners. (Wielens 2012).

The recommended actions for successfully carrying out the process from traditional closed innovation to Open Innovation can be highlighted as:

Starting with bottom-up approach, collaborating with intermediaries (Wielens 2012).

Top management involved since early stages (Wielens 2012).

Extensive training of company's staff for achieving the cultural shift (Wielens 2012).

Furthermore

Actively and extensively communicate the cultural shift towards Open Innovation, for instance via newsletter, internal magazine, annual reports, workshops, etc. (Viskari 2007)

For reaching an integral implementation of Open Innovation, it is necessary to achieve engagement of staff, customers and other related stakeholders. In order to do so, a first and crucial step is to extensively and continuously inform about this cultural shift.

Strong engagement among parties (Wielens 2012).

Getting on board proactive, risk-taking and networking employees. Furthermore, they should be empathic, able to get in the situation of the network partners. "You need people who intrinsically like to connect to other people and who get energized working outside their comfort" "Empathy, being able to imagine being in the other parties world is key, we complement teams with people who have these skills strong" (Wielens 2012).

Finally, Open Innovation requires new approaches and governance mechanisms when compared to the traditional innovation process. This entitles not only the already mentioned communication, but also the rewarding system and the IP management. This is also affected by the company's culture and strategy, as shown in the figure below:

	FIRM/CLOSED		OPEN INNOVATION			
	Authority-based	*Consensus-based*	*Partnerships/ Alliances*	*Markets/ Contracts*	*Contests/ platforms*	*(User) Communities*
Communication Channels	Vertical, socially embedded within firm	Horizontal, socially embedded within firm	Bilateral, socially embedded	Limited, Selective invitations	Horizontal, Broadcast, IT supported	Horizontal, socially embedded outside the firm
Incentives	Low powered	Low powered	Cooperative high powered	High powered	Moderate powered	Low powered
Property Rights	Possessed by Focal firm	Possessed by Focal firm	Negotiated	Externally owned and exchanged	Varied (dispersed or focal firm)	None

Fig. 53 Comparison of governance mechanisms (Felin 2012)