An internal crowdsourcing approach towards collaborative innovation for a German multi-national

BOSCH
Invented for life

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Abstract

Crowdsourcing has become a very popular field over the last decade. Many applications where crowdsourcing can be used have been identified. This thesis project researches if some of these crowdsourcing applications can also be applied for internal crowdsourcing, where the crowd consists out of the firm's employees to improve a company's innovation process. Crowdsourcing bring many opportunities for improving the innovation process, as it can help to involve and connect a larger amount of employees in the innovation process that can boost the creativity or simply reach out to more resources within a company. The research project is conducted in cooperation with Robert Bosch GmbH, which sets the context for the case study.

Based on the case study at Bosch, two use cases were identified that can improve the innovation process within tech-driven multinationals. The first and most relevant type is related to crowdsourcing solutions to specific problems, often referred as expert sourcing. In this type the focus lays on identifying the experts within the company that are then invited to solve very specific problems. The second type is related to crowdsourcing ideas. Other companies like IBM or Dell have already applied this type. In this context, it has been shown, that the second type should only be used for specific projects, as there are other more efficient alternatives available.

To define when each crowdsourcing type is applicable during the innovation process, several contextual factors were identified. One major factor is the expected knowledge distribution about the problem to be solved by the crowd, which has been transferred to the long-tail distribution theory. Moreover, intellectual property and confidentiality are factors to differentiate the type of crowdsourcing that has to be used.

In addition, a framework has been developed to codify the information about both crowdsourcing types. By applying the framework to the Bosch context, a best practice guide for future crowdsourcing campaign initiators was created.

Keywords: Crowdsourcing, Internal Crowdsourcing, Crowdsourcing for B2B, Expert sourcing, Long-tail of knowledge

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1. Introduction

The relation of crowdsourcing and innovation

Innovation is essential for the existence of every company. Different generations of innovation systems have emerged in the literature, where open innovation forms the latest generation (Chesbrough 2004). A common picture that is shown in many papers to illustrate this type of innovation system is Figure 1.

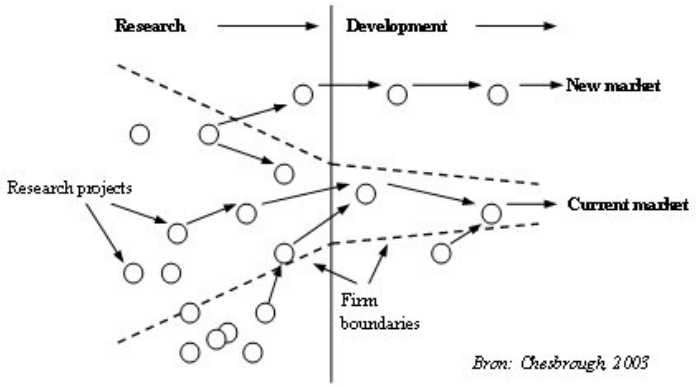

Figure 1: Open Innovation Pipeline (Chesbrough 2004)

In open innovation the boundaries of the innovation pipeline are seen as more open to the outside world, which allows innovations to be in- or outsourced during the innovation process. Crowdsourcing is often seen as one part in open innovation that allows this in- and outflow of innovations and ideas.

Crowdsourcing (CS) is frequently referred to the definition given by Howe (2006), an editor of wired magazine which refers to:

"[Crowdsourcing as an]...act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an undefined, generally large group of people in the form of an open call."

Nevertheless, open innovation and crowdsourcing is not the general solution for every company. Company culture, intellectual property strategies and secrecy are often the inhibiting factors that make an open innovation approach not viable (West & Gallagher

2006). Also dependent on the type of industry and the role in the value chain, open innovation can be less viable for one company compared another (Chesbrough 2004).

In such cases, an internal CS approach could be an alternative and an intermediate step towards open innovation. With internal CS the crowd consists out of the firm's employees and therefore only forms a small subset of the general crowd. For a multi-national organization (MNO), this crowd can still be as large as the crowds of public CS platforms on the Internet. For example, InnoCentive as one of the largest CS platforms has about 300.000 registered users (InnoCentive, 2014), whereas a MNO like Bosch has about 280.000 employees (Robert Bosch GmbH 2013). Therefore, only looking at the number of participants, internal CS has the potential to compete with external CS, when it is applied in large enough MNOs.

There are already many CS types that have been proven to be successful when applied in a general crowd. Some examples can be seen in the list below.

- **Idea / concept generation (e.g. IBM Jam, Dell's Idea Storm)**
- **Problem solving (e.g. InnoCentive, yet2.com)**
- Work packages / Micro-tasks (e.g. Amazon Mechanical Turk)
- Evaluation / Voting (e.g. Threadless, CrowdWorx)
- Funding (e.g. Kickstarter, Indigogo)
- Crowd-creation and open source (e.g. Quirky, Linux)
- Design and Creative tasks (e.g. 99designs)

A few of the above examples have been proven to be successful within companies, e.g. idea generation and problem solving.

Collaboration with Bosch

This thesis is conducted together with Bosch that forms one of these large MNOs and also plans to release such an internal CS platform to their employees. Bosch's innovation management department is planning to introduce an internal CS platform for the idea generation, which forms the first part of their innovation process. The goal for this project is to enhance the idea generation by stimulating the (virtual) collaboration within and in-between the different business divisions (BD) and business units (BU).

The planned system at Bosch focuses on the aspect of idea generation with the crowd. However, it cannot be assumed that using CS for idea sourcing is the most efficient

choice. It might be possible to use CS for other aspects within Bosch's innovation process that could be more valuable instead of only focusing on the idea generation. This thesis will conduct an analysis of Bosch's overall innovation process and emphasize on identifying gaps or problems, in which CS methods have a potential to add value and enhance the efficiency.

CS has many opportunities that could benefit for creating new innovations, e.g. the increased heterogeneity and creativity. Moreover, as normally only a small part of a company is responsible for innovation management, CS mechanisms could democratize the innovation system and involve all employees in creating innovations, which could in turn increase their motivation and feeling of belonging.

Research process

The first part of the research project will analyze the availability of CS typologies that have been researched till now. Secondly, we will summarize the potential benefits and drawbacks of CS when it is used internally or externally. This will provide us with a toolbox to design new internally usable CS types to improve Bosch's innovation system.

Next we will analyze the problems during Bosch's innovation process that various BDs are facing currently. Based on that, relevant use cases for CS can be defined that can bring the most expected benefit. For instance, if it turns out that idea generation is the least important part to look for improvement within Bosch's innovation process; then Bosch should rather focus on different CS applications, e.g. problem solving.

Secondly, after the main use cases for CS that can support Bosch's innovation process have been identified, the characteristics of this use case need to be described. To describe the CS types, a framework should be developed. This step is needed, as it is currently very difficult to describe a CS type and compare it with another. As later will be shown, the term CS is currently very broad and there are many existing typologies. So when describing the characteristics of a CS type there will be a variety of factors, which is why a framework should be developed to organize these factors and codify the information about a CS type for later usage.

For Bosch this thesis will first help to clarify their use cases of CS for their innovation process. Also in line with the currently planned tool that will be rolled out, this investigation can help to provide new perspectives on what CS is and why it could be

relevant for Bosch. One potential outcome of the thesis could be that instead of focusing on the idea generation by the crowd, which is currently the focus of their out-of-the-box solution, Bosch should rather focus on solving specific problems with the crowd. In this case the tool requirements would have to change to support this type of CS mechanism. As the software is still in an early stage and the final requirements have not been fixed, so the outcome of this thesis will help Bosch to decide if they want to proceed with the same supplier of the software and which adoptions their system would required to fulfill the identified CS use cases from this thesis.

Furthermore, the developed framework to describe the characteristics of each CS use case can be used as teaching material and a best practice guide for innovation managers that could help them in setting up CS campaigns.

1.1. Research questions

Out of the problem previously described we will try to answer the following main research question:

MRQ: WHICH INTERNAL CROWDSOURCING TYPES CAN IMPROVE THE INNOVATION PROCESS FOR THE TECH-DRIVEN MULTINATIONAL IN THIS CASE STUDY?

To identify the different types of internal CS use cases, at first the current innovation process has to be analyzed. This has to be done for several BD at Bosch, as the context and therefore the types of problems during the innovation process can be different.

RQ1: WHAT PROBLEM TYPES DURING THE INNOVATION PROCESS ANALYZED IN THIS CASE CAN BENEFIT FROM CROWDSOURCING?

The results of this thesis should reveal several viable CS approaches that could support Bosch's innovation process. The goal is not to provide a one-size-fits-all answer to Bosch about which CS application is most beneficial to them; rather several CS types could be the answers, but only in relation to a specific problem type in a specific context.

At last, the identified CS types should be described in a framework that provides an overview of the CS characteristics and best practices from setting up and executing a certain campaign type. As an example here, one major CS type that is required by most

BDs could be related to solving technical and complex problems. In this case expert sourcing is suggested by the literature as a suitable type of CS. The goal of the framework should then be, to describe the steps needed for expert sourcing, e.g. only selecting a small group of experts instead of a large group of people that will be addressed with the problem.

Therefore, the second research question will be the following:

RQ2: HOW CAN THE NATURE OF IDENTIFIED CS TYPES BE CODIFIED IN A SINGLE FRAMEWORK IN ORDER TO PROVIDE AN OVERVIEW OF BEST PRACTICES?

The outcome of this research should help Bosch to understand the different types of internal CS campaigns that are most viable for them and provide guidance in the execution of these types.

1.2. Scientific contribution

From a scientific perspective, this research project is aiming to yield new insights into the studies of internal crowdsourcing. Even though internal crowdsourcing is often not seen as a “real” form of crowdsourcing as the crowd is limited only the employees of a firm, it has been increasingly part of discussion in various research papers. Therefore, the first part in this research, which is about building a toolset for designing new internal CS types, has not been done before.

Also combining internal CS towards improving the innovation process within a company is something that has not been done before. Most research focuses on using CS mechanism for the idea generation and evaluation part as such, but do not analyze if there are other use cases and problems that could benefit from CS mechanisms to in order to improve innovation system in a company. Therefore, if the thesis succeeds with identifying multiple use cases where CS could improve the innovation process in this case study, it is likely that a sub-set of the use cases can be transferred to other companies in a similar type of industry.

Furthermore, the contextual approach to identify the different use cases for CS has not been used in the field of CS before. The approach has already been used in innovation processes by Ortt & Duin (2008), where they adopted a staged-gate innovation process to a set of contextual factors. One advantage of using a contextual approach is that the CS type can be easily determined by looking at the strongest contextual factors. For the

innovation managers that are setting up a campaign, this will be of great help, as they can easily identify the type of CS campaign they need to run. For example, assuming that the contextual factor of technical complexity is very strongly related to expert sourcing; then the initiator of a CS campaign can quickly check if he has to perform expert sourcing or something else, depending if his problem has a high technical complexity or not.

The attempts of creating a framework that consolidates the characteristics and best practices of several CS types, has not been done before. As later in the literature review will be shown, CS is a broad term that can be clustered via several typologies. At the moment there is no framework available that can describe the nature of a CS type completely. As the goal of this thesis is to identify multiple CS types, a framework that helps to describe and compare that nature of each CS types would be helpful. One benefit for the company in this case study comes from using this as a teaching material for the users of CS within the company. Another benefit for other scientific research could be to re-use this framework in case several CS types need to be compared with each other.

2. Literature review

In this chapter the phenomenon of CS will be described. Afterwards various attempts described in literature to create a CS typology will be introduced. These attempts will later be summarized in a single table that sums up the used factors to create these typologies. In the next chapter the benefits and problems of external and internal are summarized. In the last chapter, CS for enterprises will be discussed

2.1. The phenomenon crowdsourcing

In 2005, Jeff Howe firstly used the term crowdsourcing in an article for the Wired Magazine. The term consists out of the word “crowd” and “[out]sourcing” and describes an activity of “outsourcing a task to a crowd”, where a crowd is often referred to a large anonymous group of participants (Howe 2006).

Since then the phenomenon of CS quickly became a focus of many managerial magazines and scientific articles. Also visible in the Gartner Hype cycle (Gartner inc. 2013), Crowdsourcing was rated as one of the most hyped topics for the year 2013. From their analysis, they predict that CS will reach its productivity plateau in 2-5 years.

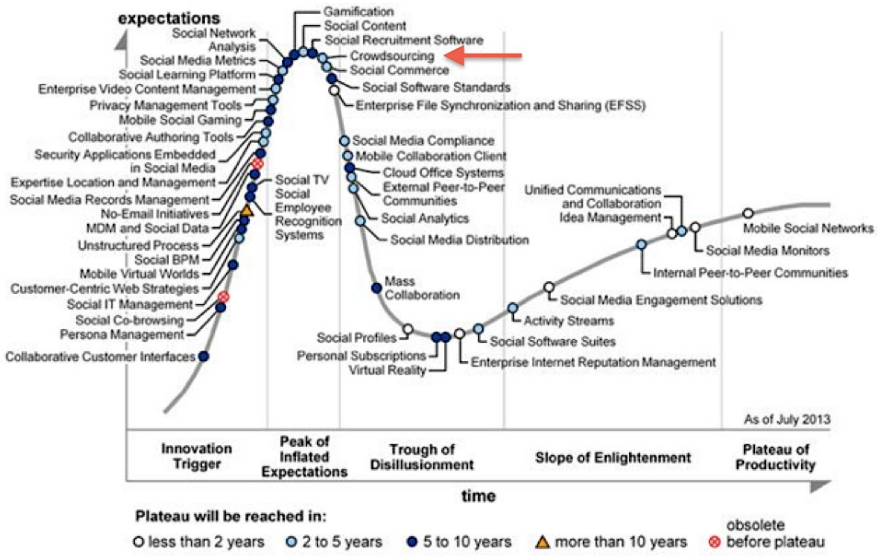

Figure 2: Gartner Hype Cycle (2013)

As it is often the case with younger scientific research areas, there is often unclarity about definitions and about how to demarcate the phenomenon from others. The following figures shows how scientific articles published with the keyword

crowdsourcing have been rising steadily over the last seven years. An interesting note here is that the phenomenon of crowdsourcing in B2B contexts is still a very new area, with only four articles in total to be found on Scopus.

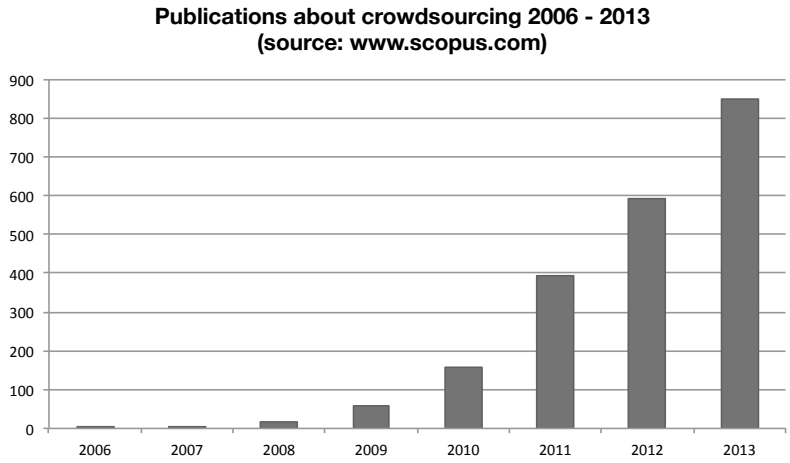

Figure 3: Publications of crowdsourcing articles

Because CS was associated with multiple study areas, the definitions began to diffuse. The following figure shows how CS can be related to study areas of outsourcing, open innovation, open source and user innovation. The proportions shown in this figure are not representative, but it correctly illustrates that crowdsourcing is a subset of outsourcing and that the studies of user innovation and crowdsourcing should be treated separately.

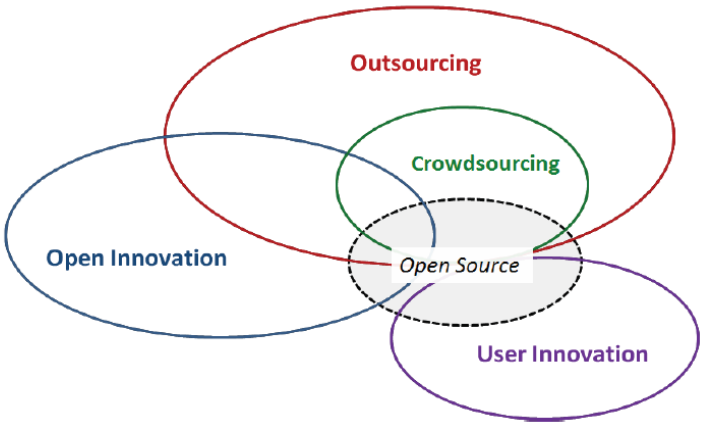

Figure 4: Crowdsourcing and its relation to other study areas (Schenk & Guittard 2011)

One widely used definition for CS was created by the meta-analysis of Estelles-Arolas & Gonzalez-Ladron-de-Guevara (2012). In their meta-analysis, they analyzed over 200 examples of crowdsourcing activities and then clustered these activities by the following

criteria. Based on that, they created an integrated definition that servers most of their analyzed crowdsourcing activities.

1. **About the crowd:**
    (a) Who forms it
    (b) What it has to do
    (c) What it gets in return
2. **About the initiator:**
    (d) Who it is
    (e) What it gets in return for the work of the crowd
3. **About the process:**
    (f) Which type of process it is
    (g) Which type of call used
    (h) Which medium used

From these categories, it becomes quickly visible that the term crowdsourcing is very flexible and can suit many different situations. For this project, the complexity of this definition reduces slightly, as the factor (d) can be set to Bosch and the factor (a) shall be set to the employees within Bosch. Nevertheless, there will still be variability within Bosch.

The goal of this typology is to create an overview of what CS types have the potential to become part of Bosch's innovation process. After we find out what the potential CS types are, we will try to match them with the innovation system Bosch has currently implemented. After this it might be possible to see which specific CS type can solve an existing problem in Bosch's innovation system.

2.2. Typology of crowdsourcing

In the following we use Estelles' structure to provide an overview of different typologies that have been created in literature. The goal of this chapter is to provide an overview of the factors that can be used to describe a superset of potential CS types. We will use these factors to later design the CS types are viable for Bosch.

The factors that build up the typologies have been collected from several sources. A good starting point to identify different literature sources were the references from the meta-analysis of Estelles and the typologies presented in an article of the P2P Foundation (2014).

(a) Who forms the crowd

As the crowd in this context will be only internal, it only forms a small subset all potentially interesting crowds in the world. Nevertheless, for MNO with a large amount of employees, there are also interesting sub-groups to consider. In an article of Simula & Vuori (2012), they analyzed crowdsourcing in a B2B context and they came up with two dimensions to identify crowds.

- *Trusted partners* / *Not trusted partners*
- *Pre-qualified participants* / *Unqualified participants*

These two dimensions are also applicable within the Bosch employee crowd. As there will be sometimes challenges, that are confidential and only some people within Bosch should know about it. Whereas there will be also problems that require a certain qualification, for instance problems that only electrical engineers can solve. Pre-qualified participants have been proven to be more effective in technical problem solving. The main challenge here is to identify these experts within the crowd, which is for instance the business model of the company InnoCentive (Simula & Vuori 2012) . This type of CS, where technical problems are sourced to a group of pre-qualified people is often referred to as expert sourcing (Meige & Golden 2013).

(b) What has the crowd to do

The type of tasks participants have to do is often used as a typology for CS campaigns. In the literature sources, there were three different typologies created based on the type of task the crowd has to perform.

Howe (2006) describes that there are four types of tasks the crowd is capable to do.

- *Crowd-Intelligence*
  Provide knowledge, creative input and ideas e.g. IBM Idea Jam, Innocentive
- *Crowd-Creation*
  Provide working capacity e.g. Quirky, Amazon Mechanical Hub
- *Crowd-Voting*
  Provide opinions e.g. Threadless, Governmental activities
- *Crowd-Funding*
  Provide funding e.g. Kickstarter, Indigogo

Another factor has been introduced by Schenk & Guittard (2011), who clustered the type of task by its complexity.

- *Simple tasks* (e.g. Amazon Mechanical Turk)
- *Complex tasks* (e.g. Innocentive)
- *Creative tasks* (e.g. 99designs)

These two factors are related, but they can't be mapped directly to each other. For instance complex tasks can fall into either crowd-intelligence or crowd-creation.

At last, a typology in form of a 2x2-matrix was introduced by Geiger et al. (2012) and clusters the way the contributions of the participants differ from each other and how the value is created from the various contributions. On the one hand the contributions can be all from the same nature (here called homogeneous), which is for instance the case in crowd-voting or crowd-funding. In the heterogeneous case, all contributions differ from each other, which is the case in idea competitions. The other factor is about how emergent the contributions are. Either all contributions will lead to one result, e.g. in open source / crowd creation, or each contribution is seen by itself, e.g. in idea competitions.

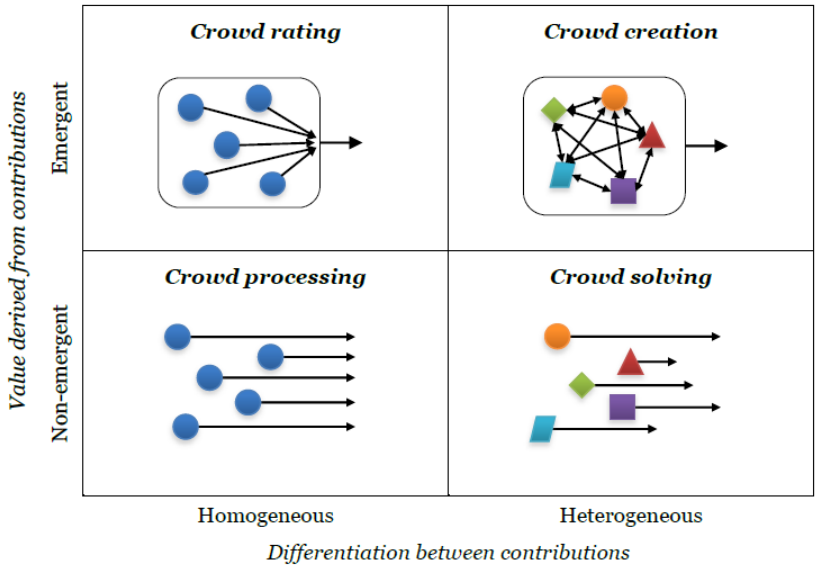

Figure 5: Typology by Geiger et al. (2012)

(c) What gets the crowd in return

The rewards and incentives of CS activities are often linked to the type of motivation the participants bring with themselves. Therefore, in the following we will provide an overview of motivations that have been researched in the context of CS. Most

motivational research studies about CS differentiate between intrinsic and extrinsic motivation (Rogstadius et al. 2011; Ryan & Deci 2000). Intrinsic motivation is derived by the interest or enjoyment in the task itself, whereas extrinsic motivation extrinsic motivation refers to finishing a task in order to attain an outcome (Ryan & Deci 2000).

In the article of Carpenter (2011) the motivations are clustered one level further. They propose four motivation clusters in CS: cause, achievement, social factors and self-efficacy. The following table provides an more detailed description for each cluster.

Table 1: Motivation elements

Type	Cluster	Description
Extrinsic	*Cause*	Related to the altruistic motivation of creating value for the society. Factors related to this type of motivation are their personal interest in the challenge and also the possibility to later realize their inputs into something bigger.
	Achievement	The achievement type of motivation is one of the most used motivators in CS. It is often related to competitions where finally someone has the chance to win. Potential rewards can be monetary or non-monetary. Gamification also falls into this category, where people have the possibility to earn virtual batches. Potential job offers or internships are also achievements related motivator type.
Intrinsic	*Social*	The social part consists of two factors. First the social motivation of interacting with people of similar interests and mindsets. The second factor applies if the CS platform represents a part of the participant's virtual identity. A factor that is often seen in open source communities, where people define themselves via the projects they put on there. Another social factor only related to internal CS is the organizational citizenship behavior (OCB). This theory tries to explain the behavior of employees to contribute value to the company without being explicitly recognized by the formal reward system (Organ 1988).
	Efficacy and Learning	Efficacy compared to achievement focuses on the process instead of the outcome - "The journey is the reward". Some people simply enjoy the process of doing design or engineering. Even children do, which is why Lego became such a popular toy. Next to the enjoyment of the process, learning and improving skills are motivators that also fall into this category.

When creating a CS platform or even a single CS event, the right combination of all these elements is needed to create the optimal motivation. Monetary rewards are

valuable motivators, but they also bear the risk of hampering collaborative innovation, as people will stop sharing their ideas with others (Carpenter 2011).

From a previous master thesis conducted at Bosch (Smertenko 2013), which covered the motivational aspects of idea management systems; it turned out that the “possibility to realize their idea” - here being part of cause - is their strongest motivator to participate. The other two dominant motivators are “monetary rewards” and “recognition by the management”. After these top three motivators, a significant gap was visible, as shown in Figure 6.

Figure 6: Evaluation of motivators for Bosch idea management [graph based on data from Smertenko (2013)]

These results were collected via a survey with a fixed set of multiple-choice answers. The answer choices were mainly focusing extrinsic motivators, whereas the intrinsic motivators are left aside, which reduces the validity. Also, this results needs to be placed into the right context, as the company might allow the participants to develop their idea further after work, which is possibly not what is intended with the results from this survey.

Nevertheless, the argument that the cause related motivation is higher than the monetary rewards is still a valuable insight and is also suggested by other literature and case studies (Holloman 2013; Sloane 2011), independent from internal or external CS.

(d) Who is the initiator?

The initiator in this case has to be part of the Bosch employees, but there is still a range of possibilities about who should set-up new CS campaigns. For instance, should the

campaign topics be created bottom-up or should they be defined by the management top-down towards a strategic goal.

Also the question towards a mediator or platform manager could be asked in this section. One main task of platforms like Innocentive and 9sigma is their functions as a mediator. Before a question will be asked to the crowd, they will make sure that the objectives of the tasks are clearly described and suitable for CS.

(e) What does the initiator get in return?

One factor that is often used to create a typography is about the problem the initiator is trying to solve by using a CS method. The type of problem is closely related to the task the CS participants have to solve, as described earlier in "(b) What has the crowd to do". But sometimes a common task can be performed because of different intentions. One example is for instance Crowdfunding. Crowdfunding is on the one hand used for funding of small startup companies, but also large corporates are using crowdsourcing more often. But their main intention is not about funding, it is about performing a pre-market validation for their product (Whitla 2009).

In an article of Howe (2006), a problem-based typography is given as follows.

- *Crowdsourcing Idea Game*
  The initiator is looking for any kind of ideas and improvements, e.g. IBM idea jam.
- *Crowdsourced Problem Solving*
  The initiator is looking for solutions to a specific problem, e.g. Innocentive.
- *Prediction Markets*
  The information from the crowd is extracted by passive observation, e.g. Google Trends, Twitter election prediction (Doan et al. 2011).

(f) Which process is used

In the following two processes will be presented that have been used for CS. In Vukovic (2009) a four step and in Gassmann (2014) a five step process were used to describe CS campaigns. In the following, these processes are summarized and compared.

Table 2: Crowdsourcing processes by Gassmann and Vukovic

Process steps by Gassmann	Process steps by Vukovic	Description
Preparation	*Registration & specification*	The most important step of a CS campaign is the preparation and specification of the CS objectives. At this point it must be clear what the desired result of the CS campaign should look like and the objectives have to be described in a clear and appealing way.
Initiation	*Initialize CS contest*	In this phase the initiator promote and advertised their campaign and spread the information to potential contributors. Some CS campaigns also have kick-off meetings before they start the online campaign. Also seeding a campaign with potential solutions has been proven to increase the amount of responses.
Implementation	*Carry out contest*	When the campaign is running the platform requires a lot of moderation. IP management is an important task of a moderator. In this phase the tool itself, can create the most value for the participants. By providing services, as file upload, dashboard, creative tools, the virtual collaboration between the contributors can be enhanced.
Evaluation	*Complete CS contest*	At the end, the evaluation of all submitted solution has to be performed. The evaluation can be either completely democratic by the crowd or performed by a previously chosen review board. In the later case, the decision criteria have to be clearly stated in the campaign description. Otherwise it could be become a huge demotivator for future participation.
Utilization		Finally, all these efforts only become valuable if the ideas will be realized. Assuming that the CS campaign was not solely done for marketing and PR reasons. Here often a critical phase appears again, as companies have to incorporate the new ideas. The company culture is a very important factor that could lead to many roadblocks (Hrudicka et al. 2011).

Most CS campaigns can be reflected towards this process. Sometimes the process contains a staged approach or iterations. For instance there could be several competition rounds, where at the beginning only a rough draft has to be submitted and at the later stages the draft will be further developed into a prototype or final product (Quirky Inc. 2014). Another case where the process is not feasible is for continuous CS activities, as Wikipedia. Here the results will be continuously elaborated.

(g) Which type of call is used

The type of call describes how participants are addressed to participate in a CS campaign. In Phillips (2010) a 2x2-matrix based (1) the way people are invited and (2) the way that they are instructed to participate create a typology of four CS types.

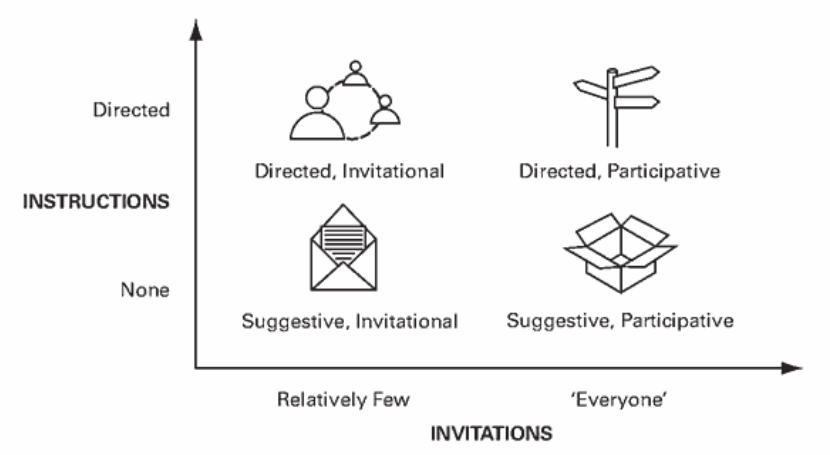

Figure 7: Type of call defined by two factors; 1) Instructions and 2) Invitations
(Phillips 2010)

People can be either invited directly (here called invitational), which is usually a selected group of people with special attributes, e.g. trusted person, people with special skills, creative people. Or the campaign could be open for everyone (here called participative). Another dimension is the way instructions are given. Either there are clearly defined instructions or problems the crowd is asked to solve or come up with solutions (here called directed). Or there is no or a very broad goal for the initiative and all kinds of ideas can be submitted (here called suggestive).

(h) Which medium is used

Almost all CS campaigns have the form of an online collaboration (Estelles-Arolas & Gonzalez-Ladron-de-Guevara 2012). But many successful CS initiatives do not only rely on online collaboration. For instance in Quirky, every month a meeting called “jam” is held, where people meet in person and decide upon which idea they will pursue further. In these real life meetings participants can also join virtually via live stream and ask questions via twitter (Quirky Inc. 2014). The main purpose of the meetings is that it bonds the participants together and stimulates the social aspect of the virtual platform. Another possibility to increase the user participation is to set up so called physical touch points. These touch points should provide a channel to connect the real with the virtual world. For instance posters in the coffee corner are a simple version of a touch point. By

adding some post-it notes to these posters, people have the possibility to discuss their ideas with colleagues when they are having a coffee break. A more advanced version of such a physical touch point can be terminals in form of a tablet, where people can input their ideas directly.

Summary of relevant typologies for crowdsourcing innovation

This section will sum up the factors that have been earlier identified in form of a table. Before we will provide the overall summary, we will filter some CS types that are not relevant for the context of innovations. This will help to reduce the amount variables for potential CS systems, as the previous typologies are kept very broad.

First we would like to exclude kind of CS that focuses on simple tasks. Simple tasks are most often referred to the example of Amazon Mechanical Turk, where people are ask to translate text, identify objects, or process other kinds of data. Therefore, also the type of crowd-processing will be excluded. This has been done, as simple tasks can only support innovation processes by offering a flexible workforce, but it is not likely that it will produce innovations itself. Also as every simple task can be defined by a specific input and a requested output, it should not be related creating an innovation and rather seen as a tool.

Furthermore, we would like to exclude the type of crowd-funding. As this thesis deals with internal CS and the aim to stimulate innovation, the funding from a crowd should not be the focus, as the funding should come from the company. There are existing examples, where companies used a virtual currency for each employee that allowed them to buy virtual stocks in innovation projects, which has also been successful. But finally, this virtual funding was rather a form of medium to enable the crowd to participate in the decision-making, which can also be seen as another form of voting. Therefore, we will exclude crowd-funding as a CS type and handle the issue of employee participation within the crowd-voting typology.

At last, we would like to exclude the prediction markets. Mostly as this type of CS activity only works well in general CS as it can help to identify trends and forecast future innovation. But in an internal environment this system would not yield valid results.

Table 3: Overview of crowdsourcing typologies

Factors derived	Source	Resulting factors	Example
Type of Crowd	(Simula & Vuori 2012)	(1) Trusted / Public (2) Qualified / Public	Employees Experts in electrical engineering
Task	(Howe 2006)	Crowd-Intelligence Crowd-Creation Crowd-Voting ~~Crowd-Funding~~	IBM Idea Jam Quirky, open source Threadless ~~Kickstarter, Indigogo~~
	(Schenk & Guittard 2011)	~~Simple Tasks~~ Complex Tasks Creative Tasks ~~Crowd-Funding~~	Amazon Mechanical Turk Innocentive, 9sigma, open source 99designs ~~Kickstarter, Indigogo~~
	(Geiger et al. 2011)	Rating ~~Processing~~ Creation Solving	Threadless ~~Amazon Mechanical Turk~~ Wikipedia, Quirky, open source Innocentive, 9sigma, yet2.com
Motivation	(Carpenter 2011)	Extrinsic – Cause Extrinsic – Achievement Intrinsic – Social Intrinsic – Efficacy	Solve someone's problems Money, gifts, jobs OCB, community feeling Enjoyment for engineering
Initiator	(Schenk & Guittard 2011)	Bottom-up / Top-down Platform mediator / direct submission	Only mgmt. starts campaigns Campaign needs mediator
Problem	(Howe 2006)	Crowdsourcing Idea Game Crowdsourced Problem Solving ~~Prediction Markets~~	IBM Idea Jam ThisIsYourPlanet.com ~~Google Analytics~~
Process	(Gassmann et al. 2014)	5 step process	n/a
	(Vukovic 2009)	4 step process	n/a
Type of call	(Phillips 2010)	(1) Participative / Invitational (2) Suggestive / directed	Only invited users can participate The topic is very open and broad
Used medium	(Quirky Inc. 2014)	Online Offline Physical touch points	Internet Workshop, Idea jam Poster, Stands, Post-its

Many factors can be used to define a CS campaign but most of these factors are related to each other. For instance the "problem" of the initiator and the "task" the users have to fulfill have a strong causal relation.

The challenge for the creator of a CS platform is now to find the right combination of these factors to create the biggest value added for both, the initiator and the participants.

2.3. Advantages and disadvantages of (external) crowdsourcing and internal crowdsourcing

In the following we will summarize the literature findings about the advantages and disadvantages in CS and also reflect them to the case of internal CS.

Scalability

Scalability is often referenced in the context of simple tasks that are sourced to the crowd. But it is also true in the case of complex or creative tasks, as the crowd can be used as an additional resource (Howe 2006). For internal CS this advantage becomes less valuable. In an internal environment, people are often bound to their day-to-day business and do not have the possibility to provide resources on demand. Nevertheless, for smaller amounts of work, CS initiatives could leverage some resources across the company. Often companies retain a small amount of the employee's working time for innovation activities. At Google this is about 20% and at Bosch it is 5% (Alex 2014). This flexible resource can be used also for CS activities, but it has to be on a small scale.

One solution to this constraint it so have staged approaches to CS, where the participants first have to submit a rough sketch and then only a winning subset of the first participants will be freed from their daily business activities to a certain extend so they will be able to continue on working on their idea.

Long-tail of knowledge

Long-tail of knowledge theory is described in the book of Bingham & Spradlin (2011). It refers to the concept that there are experts on a topic that hold more knowledge than the average person. But nevertheless, when looking at the accumulated knowledge, the larger group of regular people together - the "long-tail" - will become greater than the experts accumulated. By working together, which is what CS is aiming for; these resources can be utilized to solve a problem more completely. Especially for design tasks or problems with a high uncertainty, this curve will have a longer tail, as multiple perspectives are required. In turn, the more specific a problem becomes, the smaller the tail becomes.

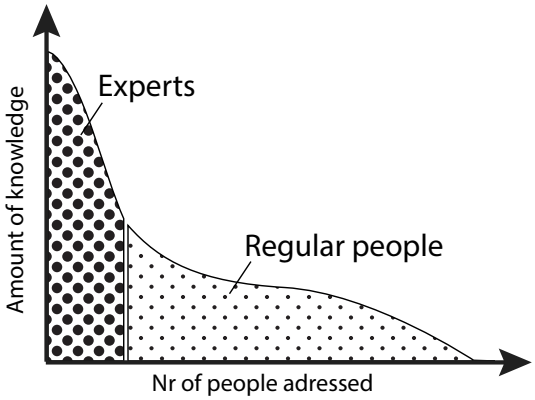

Figure 8: The long tail of knowledge

Serendipity

One often-referenced advantage of CS is serendipity (Simula & Vuori 2012; Gassmann et al. 2014; Cvijikj et al. 2011). The term “serendipity” describes a pleasant coincidence or luck. In CS the chances for serendipity are higher than for normal workshops, as due to a very large and heterogeneous crowd it is more likely that one person from a very unexpected field or background has the right idea. Serendipity is very hard to measure, there are just environments where serendipity is more likely than in others. Therefore, for internal CS the factor serendipity is lower because of the more homogeneous crowd within a company due to the company culture. Nevertheless, this internal crowd is also available of more context knowledge of the company, which might make them more capable of producing solutions that are more suitable to be realized in Bosch.

Confidentiality

In CS there have been always issues related to confidentiality as confidential problems or projects cannot be communicated to a large unknown group of people. There have been two strategies to tackle confidentiality issues in CS. One is anonymization of the initiator and the second is abstraction of the topic (Sloane 2011). Nevertheless, sometimes these two strategies do not allow communicating enough contextual information about the problem, which will lead to ideas that are solving the abstract problem, but cannot be applied by the initiator. In such cases internal CS has some benefits, as it reduces the chance of information leakage towards competitors.

IP issues

Related to confidentiality, companies might fear that competitors acquire IP related to ideas on public CS platforms before they have the chance to do so. When doing internal CS the IP situation is more controllable than in general CS (Simula & Vuori 2012). Nevertheless, in both cases an IP strategy must be defined before the start of any CS campaign. This strategy defines who will later be the owner of the IP or if the company has some exclusive usage rights on potential patents.

Social media marketing

A mostly positive, but sometimes also negative, effect of CS is related to social media marketing. As CS connects many people virtually, it can be seen a sub-form of a social media network. Often this effect brings many benefits, as the initiator can use the platform to directly communicate with the crowd and also incorporate their opinions. Often this effect is stronger than the actual outcome of a CS campaign. Taking for example Dell's Idea Storm; many critics doubt the actual benefit of this initiatives as the produced ideas are often irrelevant and it takes a lot of effort to filter, process and organize the incoming ideas. Nevertheless, numbers cannot specify the media attention that Dell received from introducing this system, but it is one of the factors, which made it a success.
Nevertheless, there are also negative examples where the social media factor has been highly underestimated. For instance Henkel with its dish-washing product Pril had a CS campaign to decide upon a new Bottle design. The winning idea was promised to be realized later. Unfortunately, the winning idea was a form of crowd-humor, as they suggested having a dishwashing solution with chicken-soup flavor. As Pril refused to consider this as a winner, a so-called shit storm on their social media platforms was created, where several thousands of people started to complain about Pril. This is a prominent case, where CS went wrong and at the end the initiator and the crowd went into a lose-lose situation.

For internal CS this social media factor can also become relevant. Marketing within the company should not be considered as marketing for new product, but rather as internal image marketing. Internal CS can therefore be used as a way of showing the employees that they are valued and that their input matters. One

But also here, each CS campaign needs to lay out the rules of participation clearly, as it should be avoided that the crowd's sentiment suddenly drops because the initiator is not sticking to their initial promises.

Crowdsourcing validation

Another benefit to be mentioned here is the possibility to validate concepts, ideas or products via the crowd. The most prominent case for this is Kickstarter, where the crowd can pre-order and fund products they like and therefore directly provide evidence if there is a market. Also for platforms that focus on co-creation with the crowd, like quirky, the validation aspect plays an important role. In Quirky the crowd is led through a product development process and can democratically decide upon product specification like price-range, features and design. Based on the amount of participants during each challenge, the initiator can estimate the market potential.

This validation aspect works quite well in general CS for B2C products, as the target customers of a product can be directly addressed and included in the development process. But for internal CS the validation aspect becomes less valuable, as the employees are not representative of a general crowd. As employees of a firm they are on the one hand influenced by the company culture, on the other hand if all employees are white collar workers, then the demographics within the company does not represent the overall market. So for general product innovation, this internal crowd is not very suitable.

Nevertheless, there are exceptions where the internal validation aspect becomes more valuable, for instance if the crowd has to validate internal products or services, e.g. improving the internal HR process or intranet. In this case the internal crowd is the end-user and can provide valuable inputs of what they would like to have or not.

For B2B products, the best crowd for validation would be the customers. But due to the usually smaller amount of direct customers, it is often more efficient to directly include them in the development process rather than building a CS system around them. Internal CS can help to provide some more insights for doing validation in a B2B context, but here it is often as well the case that those people who have the actual customer knowledge are a small amount of people and it would be more efficient to contact them directly.

Efforts in crowdsourcing

Previously only the advantages of CS have been mentioned, but what are the efforts to receive these benefits. Taking Dell's Idea Storm as an example, it is often criticized that this type of CS platform was rather a marketing success than a success in generating good ideas for the invested amount of effort. One of Dell's major problems was that they underestimated the amount of ideas that will be submitted. Then each submitted idea needs to be evaluated and they need to provide feedback to the submitter. There are also ways to reduce these efforts, by leaving some evaluation and feedback tasks to the crowd itself. For instance, often thresholds are used to pre-filter submitted ideas. This can be either done via an absolute threshold, e.g. the idea needs to have at least 100 supporters, or via a relative threshold, e.g. only the top 10 ideas will be taken into further consideration.

Another finding from the CS case of Electrolux, a Swedish appliance company, was that the amount of efforts for the preparation of a well-organized CS campaign will be very high and ought to be underestimated. When a large audience is addressed with a call to participate, it includes pre-promotion efforts. Also the structure and process of a CS campaign needs to be planned out into very large detail so that it is not prone to create any confusion among the participants. With smaller crowds the efforts are therefore also likely to decrease, as it then is easier to start a direct communication between the participants and the initiator, in case some issues are not completely clear beforehand.

Before we have been only looking at the efforts for the initiator, but for internal CS also the efforts for the crowd will account for the cost-benefit ratio of a CS campaign. If for a CS campaign 1000 people are spending 1 h of work each to participate, the cost-benefit ratio immediately worsens. Therefore, evaluation of a CS campaign cannot only rely on the tangible benefits. For instance, these 1000 employees should also enjoy this 1h that is out of their daily routine and provide them with a feeling of belonging; these intangible benefits of having a more motivated employee can quickly outweigh the costs.

The benefits mentioned above have been discussed from the perspective of crowdsourcing ideas and solutions as they are most relevant for CS in the context of creating innovation. When looking at crowdsourcing for simple tasks or work packages the efforts for the initiator are more related to the principal agent problem and controlling the results. But as this thesis is more focusing on the innovation part, this discussion will not be more discussed.

Table 4: Advantages of crowdsourcing in an external and internal environment

Advantage / Disadvantage of CS	Applied in general CS	Applied in internal CS	Summary
Scalability	+	-	Scalability is not viable for internal CS as the employees are bound to their day-to-day business and should not be the main expected benefit.
Long-tail of knowledge	+	(+)	Even though the general crowd is larger than the internal crowd, for larger MNOs this factor still applies.
Serendipity	+	(+)	Also here the general crowd is larger than the internal crowd, but for larger MNOs this factor still applies. In addition to that, the internal crowd has more context knowledge available, which increases ideas that can be directly applied.
Confidentiality	(-)	(+)	Confidentiality is better controllable for internal CS campaigns.
IP issues	(-)	(+)	IP is better controllable for internal CS campaigns.
Social media marketing	+ / -	(+ / -)	CS can create lots of media attention and can be a good marketing mechanism. For internal CS also true, as the company is creating a more innovative and agile image for its employees. The social media effect can also drop, if the initiator is treating the crowd unfairly or does not stick to its initial rules.
Validation	+	(-)	CS is often used for validation and customer co-creation. For internal CS the crowd is not representative enough for a general crowd.
Efforts	0	-	Often the overall efforts for CS are underestimated. Significant efforts occur during the preparation, moderation and evaluation and correlate with the crowd size. In general CS the initiator receives efforts from an anonymous crowd outside. In intern CS the participants are the initiator's employees and increase therefore to the overall efforts.

Overall we can observe that internal CS has some drawbacks compared to external CS. Nevertheless, these disadvantages will reduce with the size of a company. As stated in the introduction chapter, even the largest external CS platform providers do not have more than 300.000 which are about the same number of people for a large MNO as

Bosch. Also with respect to heterogeneity, in companies this factor will be smaller compared to an external crowd. But also for a platform provider like Innocentive, they will also only attract a certain target group, which in turn limits their heterogeneity as well.

To sum it up, internal CS should not be seen as the only means to new innovation. It has its advantages, as it is less resource consuming to manage an internal campaign compared to an external campaign. The used language is already familiar to the employees and there are fewer conflicts due to IP and secrecy. Also internal CS campaigns can later on be transferred into external CS campaigns, as most of the preparation work has already been performed. The challenging tasks now is to find the right CS types that can make use from the above mentioned benefits and are at the same time able to deal with the mentioned drawbacks in an efficient way.

2.4. Organizational traits and roadblocks of enterprise crowdsourcing

The last section of the literature review will describe the organizational aspects that can either enhance or form roadblocks for the introduction of crowdsourcing.

The aspects mentioned here are from and article of Hrudicka et al. (2011), which were describing the roadblocks during the transition process of MNOs into open innovation. Several of these aspects have also been mentioned again in a case study of the introduction of an crowdsourcing platform for idea generation at Electrolux, which provides a very comparable case (Holloman 2013).

The below mentioned roadblocks are therefore listed here as later on it will be shown that the top management needs to address these roadblocks when they are rolling out the CS system.

Perspective on risk and failure

Innovation is always related to risk. By trying out something that has not been done before it is impossible to predict the outcome. Therefore, innovations that fail to be realized or reach a market cannot be avoided. For most companies failure is still a taboo topic. No one wants to be justifying their decisions that led to failure in front of the top management, as it will decrease their later career opportunities. In the worst case, the

management could label you as a “renegade” and they will try to transfer you to a section where you can only do “less harm” to the company (Hrudicka et al. 2011). In many companies, this perspective on risk a failure is still applicable. Especially for larger corporates with a resource based view having a higher risk aversion than small or medium sized companies is very likely (Wernerfelt 1984).

Therefore, for crowdsourcing campaigns the outcomes are often also unpredictable and the heterogeneous amount of ideas are hard to evaluate against corporate KPIs. But these ideas need a protected space to grow for some time, before they actually have the chance to provide prove of concept. Taking these risks should be encouraged by the top management, at least to a certain extend. But also the employees must accept the stopping of ideas at some later point. Failed ideas should then not be considered a personal failure, but rather a lesson learned. So even if ideas fail, they still created value by providing new insights and skills for the employee and the company (Sitkin 1992).

Trust and commitment

Crowdsourcing campaigns require commitment from someone that is willing to take the outcome of a CS to the next level. To fulfill this commitment, that person needs to allocate resource before the start of a CS campaign. Only when the company shows their commitment, the CS participants can build up trust. This trust is important, because it will allow these participants to take a certain amount of risk, for instance investing more time in developing their idea further (Hrudicka et al. 2011).

Therefore, it is especially important in the beginning when CS is first applied at a company, that this commitment is communicated from the top management throughout all levels in the company.

Collaboration and Silo behavior

Many traditional companies with a strict hierarchical structure disincentivize knowledge sharing within the company. Often the KPIs and the rewards are set in a way that a single business unit will locally optimize their position instead of optimizing overall company. For instance if one KPI is set to be the amount of innovation projects a business division creates, they will not feel the urge to hand over innovation projects to other business divisions even if they would have a greater chance of success there. This situation worsens, if monetary rewards are coupled with these KPIs (Gassmann & Schweitzer 2014).

The companies need to rethink their measuring and reward systems. The system should incentivize collaboration and knowledge sharing if they want to have successful CS campaigns.

Not-invented-here syndrome

The not-invented-here (NIH) syndrome is often referred to one of the negative traits a company has to deal with when they are reaching towards CS and open innovation. The NIH syndrome has many causes which all need to be addressed when trying to overcome this issue. One major cause of NIH is the fear of being replaced by other solvers. People usually own certain problems and they want to be acknowledged for being an expert in this area. For those people it is often perceived as cheating if they copy the solution from somewhere else instead of figuring it out by themselves (Hrudicka et al. 2011). The counter movement of NIH is often described as “proudly-found-elsewhere”. Also here, only strong leadership commitment can trigger such a cultural change. The employees need to be encouraged to look outside for already existing solutions. Also it should clearly be stated that people will not have to fear loosing their jobs or responsibilities, rather they have the opportunity to grow further in their role (Bogers & West 2012).

Intellectual property strategy

Companies that want to reach towards open innovation often need to adopt their intellectual property (IP) strategy. Whereas in most traditional industries, IP is often seen as something that needs to be “protected and reserved”, which will not work for open innovation and CS (Resnick 2011). The strategy needs to shift more towards focusing on utilizing IP. A famous example for this is the collaboration of Quirky and GE. Here GE publishes unused patents on the CS website and encourages people to utilize them in some way.
Also related to CS the question about who will later on own the IP often creates conflicts within inventor, contributors and sponsoring companies. A clear IP strategy must be developed for each CS campaign and the rules of the game need to be communicated in a transparent way. So it will be clear what the participants, contributors and sponsors can expect.

2.5. Conclusion

In this chapter the factors that can define a typology of potential CS campaigns have been analyzed. The factors that have been mentioned here are highly correlated to each other and the success of CS campaigns depends on finding the right combination. The factors introduced here will later on be used to define the CS types that will be most beneficial for the Bosch context. Furthermore, an overview of the mostly referenced benefits of CS is given. The benefits of a large general crowd were then reflected to using an internal employee crowd. Most of these potential benefits become less valuable as the employee crowd is smaller and less heterogeneous. Nevertheless, the larger and the more diverse a corporation is, the more these differences will disappear. At last, an overview of the organizational traits and roadblocks is given. For organizations that are planning to reach out for open innovation and CS it is important to see if their current organizational structure and culture is capable for this.

The factors in presented in this literature review will be used as building blocks or a tool set for the next chapters. Next we will try to analyze the gaps and opportunities within Bosch's innovation process and we will try to build a CS solution with these building blocks just presented that are most suitable for improving the innovation process.

3. Bosch context

This chapter has the purpose to create an understanding of the overall context where thesis is conducted; also as some of these aspects will later on impose some constraints on the design of the CS system.

Therefore, in the following the company Robert Bosch will be introduced and it will be shown in which industry sectors the company is active. Afterwards the innovation system that is used at Bosch will be described. Next, the current activities that can be related to CS within the company will be listed. At last the boundary conditions that are relevant in this project will described. The boundary conditions will be analyzed by looking at the stakeholders that are involved in enabling the new CS system.

3.1. Bosch and Technology for Life

Bosch is a German multinational, which is specialized in engineering and electronics. The naming father Robert Bosch founded the company in 1886, which has grown to now be the largest supplier for automotive components with having over 300.000 employees in over 60 countries worldwide (Robert Bosch GmbH 2013).

Bosch's vision is to create technology and products that creates value for their customers, which is also shown by their slogan "Technology for life".

Bosch's largest business sector is the automotive industry with Bosch as a component supplier, which forms about 2/3 of their sales. Other B2B segments are industrial, energy and building technology. On the B2C segments, Bosch is active in power tools, home appliances and car multimedia. The B2C segment in total forms only about 10% of their total sales. The other 90% are from B2B activities.

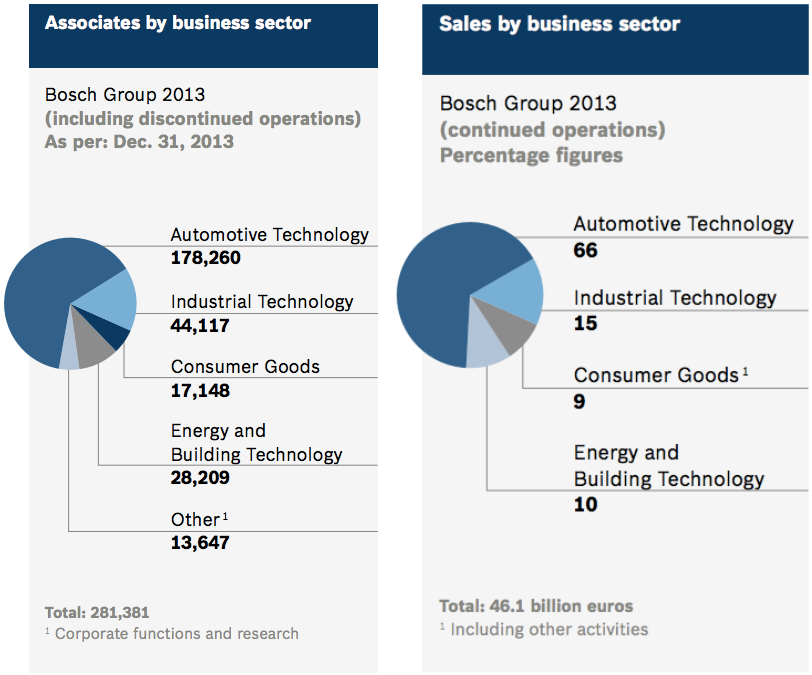

Figure 9: Bosch's associates and sales by business sector (Robert Bosch GmbH 2013)

For every company, but especially for tech-driven companies like Bosch, innovation must be an essential part of their strategy to expand and also secure their market position. Therefore, Bosch invests largely in research and development (R&D). In 2013 Bosch invested 4.5 billion € into R&D which is about 9.9 % of their total annual sales. Compared to the 2013 EU Industrial Scoreboard, companies active in automotive & parts on average only have an R&D investment of about 5.1% of their net sales (European Commision 2013). This also shows that for Bosch innovation is an essential part of their strategy.

As in the earlier chapters already mentioned, Bosch's organizational structure is decentralized and split up into many loosely coupled business divisions BD's. Each BD manages their R&D activities independently. To coordinate the different R&D activities, Bosch has a separate BD called "Central Research" (CR). The structure is illustrated in Figure 1.

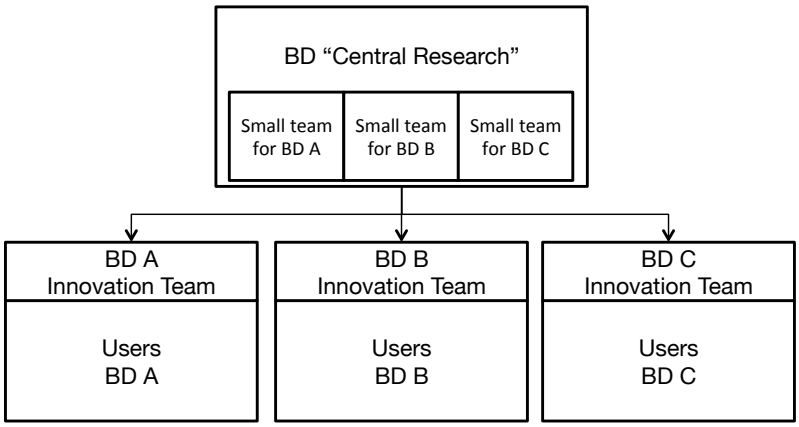

Figure 10: Innovation Organization

In the literature this innovation structure is often referred as *locally leveraged strategy* (Schilling 2003). Each BD conducts it’s own innovation activities, but the CR division aims to leverage the resulting innovations throughout the company. Furthermore, the CR division is focusing on basic and applied research often together with universities. Therefore the developed technologies at this division are often not tangible enough yet to directly address customers. In this division the innovation generation can be described as mostly *technology push* type of innovation. Even though recently they are shifting towards a more open innovation structure, by extending the collaboration with universities, suppliers and also startups.

Within the individual BDs the innovation system mainly depends on the type of industry they are active. As for the B2C divisions, the innovation system can be described as mostly *market pull*. Even though there have been also many activities recently towards co-development (e.g. using lead users) and using open innovation methods (Robert Bosch GmbH 2013). This is what is stated on the intranet and internet, which might still differ from the actual usage. For the B2B divisions, the main innovation system seems to be *technology push*. This can be derived from their IP strategy. Companies that follow the technology push approach tend to create more patent applications than others (Crepon et al. 1998), as they have to protect their initial investment in R&D. As Bosch became worlds 43rd largest patent owner and has been the 71st largest applicant for the duration of 2013 to 2014 (Advameg Inc. 2014). This can be seen as an indicator, that a large part of their innovation system is still following a “technology push” approach. Nevertheless, there are also examples leaning towards open innovation, where the B2B divisions work closely together with suppliers, customers and even competitors (Robert Bosch GmbH 2014).

3.2. Innovation process at Bosch

As this thesis is aiming to generate CS types that can improve Bosch's innovation process, first the current innovation process should be described. When looking at the current innovation process, it might be possible to identify potential anchor points for new CS activities that can help to improve a particular in this process. It then needs to be decided for which part in the current innovation process CS has the strongest value.

The central innovation department defines Bosch's innovation process and all BDs are currently following this definition, which was also confirmed during our interviews. The defined process is rather abstract and it leaves room for interpretation, so each BD can adapt this process for their internal needs. As an example, the central innovation process requests a market size estimation, but how this big the market size finally has to be is kept open. So for small BDs it should be over 100 000 € whereas a larger BD needs a market size greater 10 000 000 €.

An illustration of the overall process is shown in Figure 11.

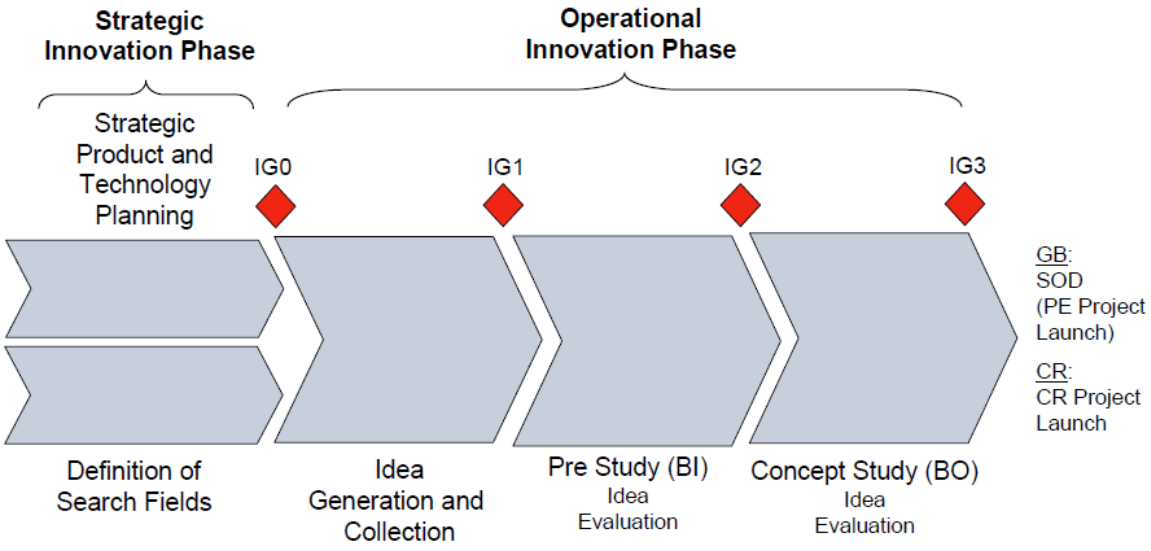

Figure 11: Innovation process at Bosch [Bosch innovation handbook]

Bosch's innovation process is structured into two phases. The first phase is called strategic innovation phase. In this phase strategic decisions are made for the whole Bosch Corporation to align its individual BD's innovation activities. One part of this strategic phase is the technology and product road mapping, which has the goal to distribute tasks to individual BDs and avoid starting redundant research activities. The second part is about the definition of search fields. Search fields are related to trends in the economy and technology. These search fields are later on assigned to each BD. The

overall goal of this first phase is to provide a direction for each BD's future innovation activities. To reach this goal, a check-gate, here called Innovation Gate 0 (IG0) is introduced, which tries to ensure via a steering committee that the defined search-fields and technology-/ product road maps are aligned with the overall corporate strategy.

After this phase an operational innovation phase follows, which has the form of a stage gate approach. The goal of the second phase is to generate ideas and also develop these ideas to a mature level that it is possible to hand over the ideas to series production, which also forms the end of Bosch's innovation process. After the end, the concept is handed over for series production and the product development process is applied. For this thesis, only the innovation process is introduced, as the research is trying to find CS types that can support for this phase.

As shown in the figure, the first stage is related to the generation and collection of ideas. This can be from internal or external (scouting) sources. To reach the next stage, each idea needs to pass the IG1, where a defined committee at the BD tries to evaluate the potential of the idea. After the IG1, each idea receives a package of resources, which could be money or a small team, to develop the idea further. The next two phases focus on the development of the idea and on creating a pre-validation. For the next gates, IG2 and IG3, the evaluation criteria will increase and the steering committee expects answers in more detail. Also here, after the next gate has been passed, more resources are provided to work out the idea to a more detailed concept.

The following table is an example of some evaluation criteria that are checked by the steering committee during each phase. This overview is not aiming to be complete it should only help to create a better impression for the reader of what is expected at each innovation gate.

Innovation Gate	**Examples of evaluation criteria**
IG1	Idea description with rough technological feasibility estimation Estimation of customer group and benefits for customer Estimated market size

Innovation Gate	Examples of evaluation criteria
IG2	Detailed customer segmentation
	Product / technology specification defined
	Functional prototype available
	Analysis of patent situation
	List of potential competitors
IG3	Detailed market size
	Detailed sales, profit and cost estimation
	Product / technology specification for series development
	Technical impact and risk analysis

What this overview is trying to show is that the efforts of bringing an idea to something that is ready for production are very high and it requires a lot of knowledge in several domains, e.g. marketing, legislation and production planning. For this is the reason, CS is most commonly only applied to first stage, as the efforts are relatively low for the participants to come up with an idea, which is something that an employee could do during their daily business activities. For the latter gates, it might be still possible to include crowdsourcing mechanisms, but then the task that is crowdsourced must be split into small work-packages, which could be for instance the consultancy of experts to options during for a decision process. In the later analysis with the innovation managers at the BDs we will try to analyze which are the current problems in this applied innovation process and then decide if there are CS types available that can solve these problems or sometimes provide a more efficient alternative to existing methods with CS.

3.3. Innovation activities at Bosch

In this chapter an overview of the existing activities at Bosch will be shown. This overview should help to understand how the development of the new CS system would distinguish itself from existing or already tried solutions.

Bosch clusters their innovation activities into three major pillars. Having different goals attached separates the pillars.

- **Patent applications**
  Goal: Create intellectual property protection
- **CIP – Continuous improvement process**
  - Regulated by German law (Betriebsverfassungsgesetz n.d.)
  Goal: Enhance processes within the company
- **Innovation Management (IM)**
  Goal: Create new products and services

The CS activities that are described in this thesis will focus mainly on the last part Innovation Management, with the goal to create new products and services. Nevertheless, sometimes there is some ambiguity, as some innovations that aim to create new products also create patents. Also if an internal process optimization enables the company to produce new goods, then it would fall into the CIP and Innovation management procedure. The problem with this cluster is that the company splits these sections into different divisions with different responsibilities, which could sometimes lead to miss-alignment.

In the following table an overview of the different innovation channels is shown. This overview also lists some other activities that can be related to innovation management and crowdsourcing, but do not fit into one of the previous clusters. The overview also shows if the resource is accessible only internally (employee) or externally (non-employee, everyone). The new CS system is also shown in this overview, marked with an asterisk (*).

Table 5: Innovation channels within Bosch

Cluster	Accessible	Name	Description
Patent division	External & Internal	Bosch – Your invention partner	Scouting of new IP to be utilized by Bosch
CIP	Internal	CIP portal	Company wide portal to submit ideas that improve the inner processes
IM	External	Genesis portal	Scouting for new suppliers
		1-2-do.com	Customer co-creation for power tools, Feedback, Social Media
		Auto repair portal	Customer co-creation for automotive components to end-customers, Feedback, Social Media
		Power Tools open innovation portal	Solution sourcing
	Internal	Social enterprise network (Idea blog)	Within the Bosch social network, there is an option to start ideation campaigns. Users can submit ideas and vote on other ideas. Usually on a smaller scale within communities of practice.
		BD specific innovation portals	Every BD currently manages their own innovation database; some have simple pen and paper boxes, whereas some already have innovation portals. Four out of twelve GBs already have online innovation portals.
		*** New CS platform to be developed in this thesis**	Enable innovation and collaboration over different BDs. Innovation areas are defined by strategic decisions of the innovation managers.
Others	Internal	ask.bosch.com	An information platform, similar to ww.ask.com, where people can post questions to certain tags and other people who assigned to these tags can help to provide answers.
	Internal	Bosch Expert Organization (BEO)	An expert network of people who are considered technological experts in their domain. They are often active in standardization and other committees.
	Internal	Bosch Management Advisors	This group consists of retired managers at Bosch that still want to support the company with their knowledge.

As in the introduction mentioned, Bosch is currently already developing one CS type that is focusing on the idea generation with its employees. This CS type has already two competing innovation channels. The main question here is, how is the CS system different to these competing channels.

First of all, the CS system is aiming to foster cross-BD innovation, which is not possible with the BD specific solutions. There are still eight BDs with a low-fidelity innovation system (e.g. Excel sheet). For them the new system should simply provide more features and motivate them to change to the new system. For the four other BDs that already have a solution with high fidelity it depends if the new system can satisfy their needs. The more BDs are active on one system the more positive externalities it will create. So the strategy at the moment is to convince a critical mass to make use of the new system and then expect the others to change afterwards. The outcome would be that it would cannibalize the existing innovation portals of the BDs. Therefore; the new system should be more appealing and provide more features than their existing solution, to make this cannibalization more smoothly.

The new CS system should also be a statement from the top management at Bosch to foster a more open innovation culture. As a pre-fetch from the next chapter, it turned out that the BDs are often in competition with each other. The management KPIs at the moment are not suitable for collaborative innovation, which led to statements like “Why should I give away my idea for free to this BD?”. This in total leads to local optimizations within the BD, but in turn reduces the overall benefit of the company. Therefore, this system should also become a symbol for companywide collaboration.

As of now, the new CS system is an out-of-the-box solution from one of the market leaders in innovation management software. The system therefore fulfills a generic use case of CS for innovation but it needs to be tailored for Bosch’s needs during innovation process. This thesis will therefore aim to identify the use cases within Bosch’s innovation process and then create recommendations if this system can actually satisfy Bosch’s use case already, if it needs some special adaptations or if a self built system should be considered.

3.4. Boundary conditions at Bosch

In this section some boundary conditions that the new CS system has to meet will be shown. Introducing this system on a large scale within a big multination often needs to convince multiple stakeholders. For Bosch there are two stakeholders that put special requirements on future CS systems. These requirements have been discussed during some internal workshops at Bosch and are worth to be mentioned here.

The German workers council sets one requirement. As the introduction of internal CS systems involves a large group of the employees, the workers council needs to ensure that the rights of the employees are secured. In the topic of CS activities they have been mainly concerned about the possibility to evaluate an employee's performance via the CS tool. It might be possible to track how much time an employee is spending on the tool or how many good ideas or comments he provides.
Therefore, when a CS system is about to be introduced, it must be ensured that such information cannot be extracted. This constraint therefore also does not allow gamification elements for a CS system. Even though literature suggests that for CS activities, gamification elements are stimulating for the crowd; it would not be possible in this case, as it would block the introduction of the system.

The second stakeholder that lays constraints in the CS system is the German law and Bosch's legal department. Export control, defined by the German Federal Office of Economics, does not allow discussing about goods that can be used for weapons or defense products. For Bosch there are many so called dual-use goods, for instance generators that could be also used for defense products like tanks or drones (BAFA n.d.). If during a CS process something is contributed that can be related to IP and a dual-use good, there needs to be a way to isolate this contribution from foreigners. This constraint can reduce the benefit of every CS system, as it limits the amount of people that can participate on such a system. As shown in the literature review, the benefits of CS significantly depend on the amount of participants. In turn, if the participants are only limited to a small group of users, the value reduces as well.

There have been also some further stakeholders that set requirements for the CS system, but the two mentioned here were mainly shown as they are setting the biggest constraints for the CS types.

4. Research approach

In the following the research approach will be illustrated. Starting with the research strategy, which will argue why this thesis will take the form of a case study. Followed by a description of three research phases that aim to answer the previously given research questions. At last an overview of the used data sources and the methods used to extract the needed information.

4.1. Research strategy

The research will have two parts, first an exploratory part followed by a confirmative part aiming to validate some of findings during the exploration. The research will be conducted as a case study as this project starts with the exploration (Yin 2009). The type of case study will be a single case study with multiple units of analysis.

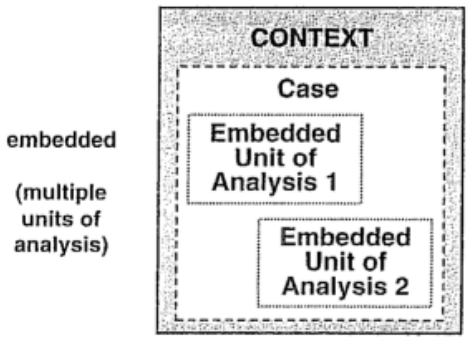

Figure 12: Single case study – embedded (Yin 2009)

Having a single case study is mainly chosen as this case provides a unique opportunity to be studied. The unique opportunity is mainly given due to the fact that at Bosch this internal CS system will be introduced for the first time and observing this pilot phase offers a short window of opportunity to collect data. Also as the resources for a master thesis are limited, a multiple-case study design would have not been feasible.

The single context of this case study will be the introduction of one centralized internal CS system. Each BD has its own context (e.g. innovation system and culture) due to Bosch's decentralized structure, but for this case study their internal context will be seen as a part of the unit of analysis. The overall context in this case study is about the introduction of a common CS system, suitable for all BDs.

4.2. Research phases

The case study will be structured into three different phases, with the aim to answer the individual research questions.

1. Identify problems within innovation process and an initial set of internal CS types that are most beneficial for Bosch
2. Build framework to describe best-practices for these campaigns
3. Validate framework and suggested best-practices with experts

In the following, the approach for each phase will be explained. Each phase will later be described as an individual chapter. This section should serve the purpose to explain the overall research approach and provide the reader an overview of the research approach.

Phase 1: Identify problems within innovation process and an initial set of internal CS types that are most beneficial for Bosch

To identify the initial set of beneficial CS types we planned to analyze the currently implemented innovation process for several BDs. To determine the kinds of suitable CS types, we chose to analyze this process with two methods.

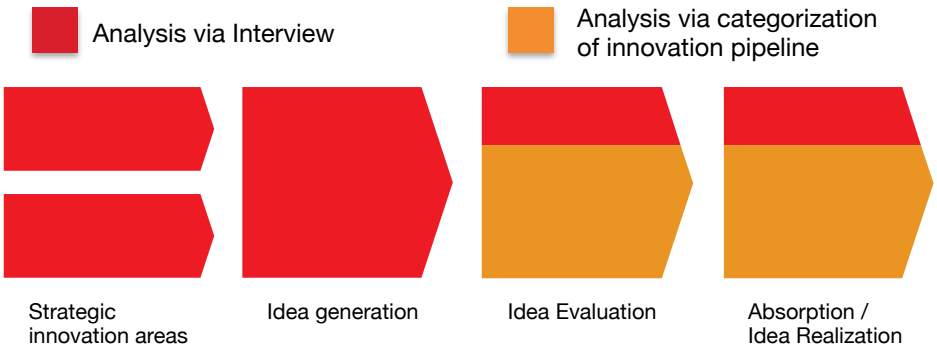

Figure 13: Two ways to determine suitable CS campaign types

At first, we decided to do semi-structured interviews with different innovation managers of several BDs and the aim to understand the problems they are currently facing. These interviews are mainly focusing on the first phases of Bosch's innovation process, as we planned to analyze the later part via a second technique. We extended these interviews with some creative card sorting activities. The benefit of card sorting is that it can trigger the creativity and make the interviewee think in different perspectives. Also by asking

why someone sorted something in a particular way often reveals internal thoughts that would not come up in a normal interview.

Figure 14: Card sorting as a creative interview method

Secondly the innovation managers of the various BDs were asked to scan their current innovation repository and categorize the innovations based on a given set of context variables that have been extracted from the expert interviews and complemented by literature suggestions. These contextual variables, should first define the type of idea that has been submitted, but also yield information about the source of the idea and the problem behind the idea. As an example, one division has many ideas that have been generated by the employees itself. In this case the factor of how the idea was triggered, if it was from an engineering or manufacturing team “bottom-up innovation” or something that was suggested by the central research division “top-down” would yield insights if it was a user innovation or not. In case there are many ideas generated by user innovators, there should be a CS type to emphasize this development.

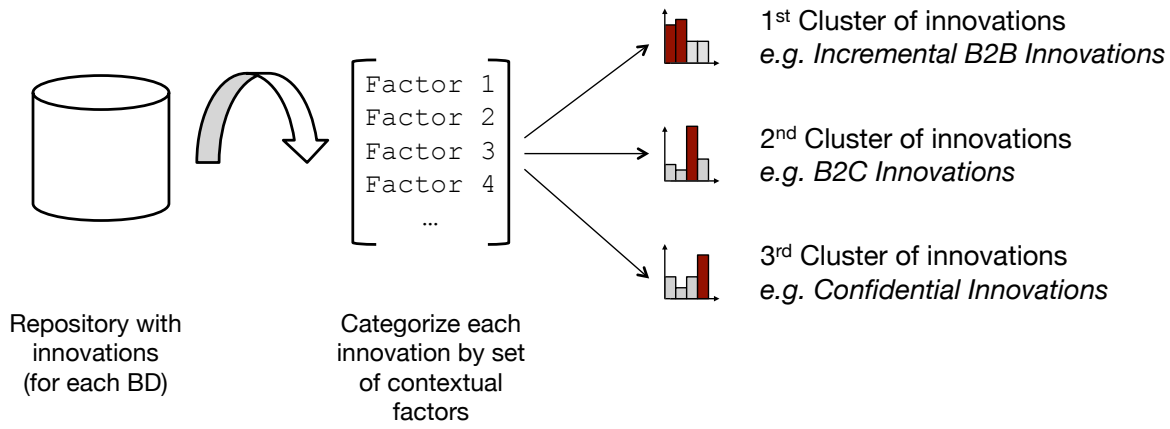

Figure 15: Determination of innovation clusters via contextual factor mapping

After receiving the results of the idea rating from the innovation managers, it might be possible to cluster categories of ideas. Ideally there would be some dominant patterns that allow the prioritization of CS methods that are more suitable to solve problems of the most common innovation types.

By scanning the innovation process with these two methods, it might be possible to identify pressing problems or situations for which CS can be used as a suitable alternative. To identify these types the findings from the interviews can be reflected to the identified types of innovations that Bosch generates. With that it might be possible to assign problem categories to types of innovations. Ideally, some of the problems would only occur for a certain innovation cluster. For instance, issues with IP are very likely to only appear on technological innovations, why could mean that for this case only a CS type that can handle IP issues would be suitable. In the following figure the findings during the interviews are illustrated via puzzle pieces. The shape of the puzzle pieces varies as it aims to represent the different types of innovation. To find suitable CS type it is sometimes possible to identify similar puzzle pieces and relate them to a CS type that can solve these problems.

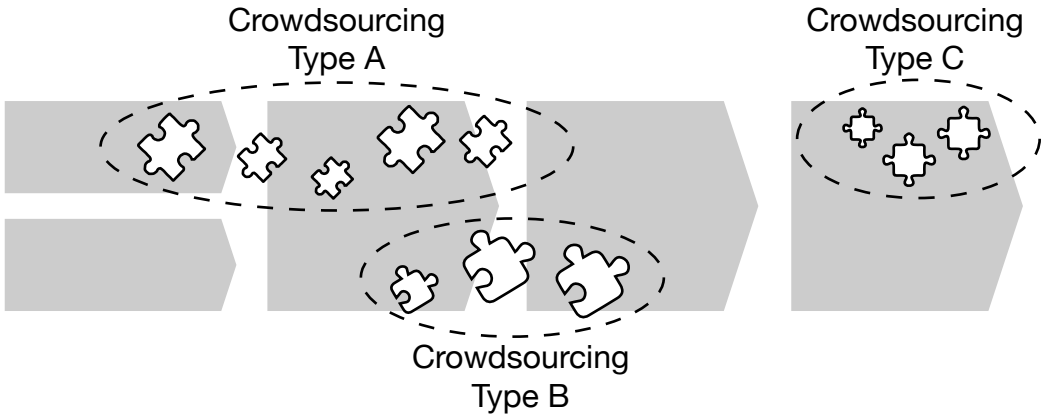

Figure 16: Finding suitable CS types within Bosch's innovation process

Phase 2: Build framework to describe best-practices for CS campaigns

After the CS types have been identified, the focus will shift to the creation of best practice guidelines. These guidelines will be consolidated into a single framework that should describe the process steps and the characteristics of each CS type.

By using this framework the innovation managers at Bosch will be able to identify the right CS campaign based on the innovation problem they are facing. Furthermore, the

framework should give the innovation managers guidance when setting up and and executing a CS campaign.

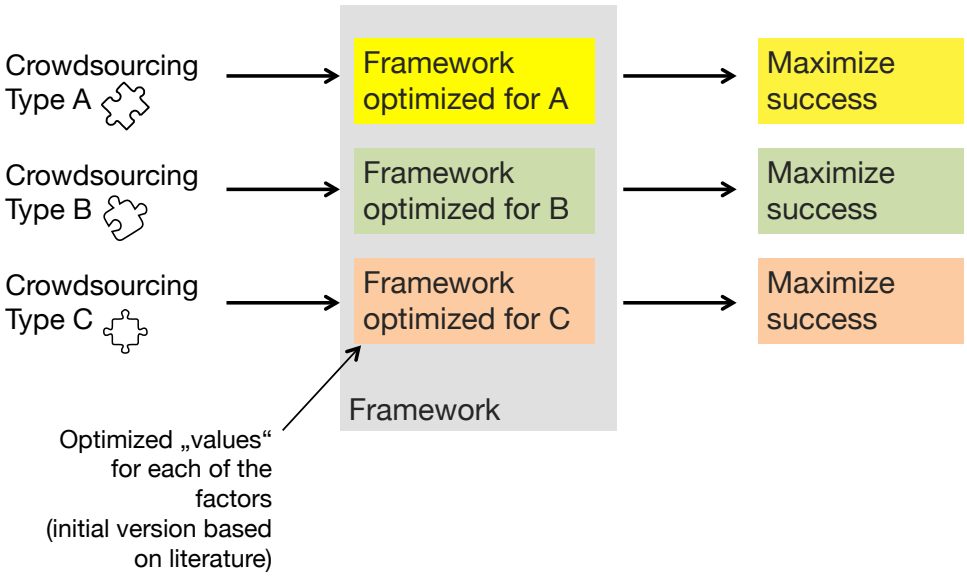

Figure 17: Overall framework, containing optimized variants for each CS type

The initial framework will be extracted from scientific literature and then adopted to the context of the different CS types. One example for this abstract concept could be: the case as mentioned earlier in this chapter might be an innovation problem of high technical complexity, where the literature would suggest expert sourcing as the most viable form of crowdsourcing. In this case the framework would suggest a process that ends up in performing expert sourcing, which for instance requires to carefully identifying a small but knowledgeable target group. Whereas in the case of crowdsourcing new ideas and concepts, the process would suggest a target group which is rather large and heterogeneous from their backgrounds.

Phase 3: Validate framework and suggested best-practices with experts

The last part of the thesis will handle the validation of the previous findings. The validation will first focus on validating the identified use cases and secondly if the developed framework fulfills its purpose as a best practice guide to describe the characteristics of each CS type properly.

The validation part will also be done together with the innovation managers. By presenting them the results of the different CS types, the innovation managers are asked

to categorize a set of historic CS campaigns into one of the CS types. With that it should be possible to see if the differentiation between the use cases is clear to them.

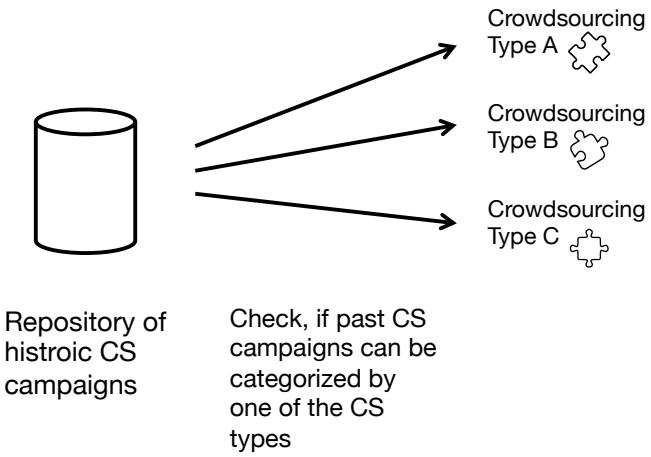

Figure 18: Validation of framework via existing data in idea repository

After the categorization, the innovation managers are asked to answer some interview questions regarding what they think is the most important CS type for their BD and for Bosch overall. This interview will also handle some questions regarding the design of the framework, if it can in the future be used as a best-practice guide at Bosch.

4.3. Overview data sources and methods used

The following list gives an overview of the required data sources and the methods used to extract the information

Table 6: Overview of data sources and methods

Research Question	Data source	Method to access source
RQ1 (Phase 1)	**People** – opinion from experts / innovation managers at Bosch BDs	**Semi-structured interview** with 8 individuals, additional use of card-sorting technique.
	People – opinion from experts / innovation managers at Bosch BDs	**Survey** to extract importance of different context factors to the ideas within their innovation pipeline. Also with 8 individuals.
RQ2 (Phase 2)	**Literature**	**Meta analysis** – Determine which types of CS exists and can be related to the needed CS types
MRQ (Phase 3)	**People** – opinion from experts / innovation managers at Bosch BDs	**Expert interview** – Validation of research findings with 8 individuals

5. Identified Crowdsourcing types

To identify suitable CS types, we were using a two-folded approach. On the one side, we analyzed the pressing innovation problems and then decided, which CS type can be used to solve such a problem. On the other side, we analyzed the current innovations in the pipeline and then re-constructed the CS types that deliver these types of ideas. By looking at both ends, it might be possible to define a set of CS types that are most relevant for Bosch.

5.1. Interviews to analyze problems during the process

The innovation managers for this initial interview have been selected in a way that their BDs have a strong diversity in their structure and function within the organization. This should help to identify a wide span of use cases. However, also the availability of the different innovation managers played a role in this selection process.

In the following an overview of the selected BDs can be seen. These BDs together form about 60% of Bosch's business in sales, but as the number of samples is very small it cannot be assumed that the results will represent the needs for the overall organization.

Table 7: Interviewees from different BDs

Description	Role	Relative size	Industry	Main deliverables	Customer
Automotive Electronics	BD	Large	Automotive / Sensor	Components	B2B, Internal
Corporate Research	BD	Small	Cross	Technology	Internal
Device Control	BD	Large	Industrial control	Components	B2B, Internal
Power Tools	BD	Medium	Consumer goods	Customer Goods	B2C
Starter Generators	BD	Small	Automotive	Components	B2B, Internal
Chassis Control	Central	Large	Automotive	Components	B2B
Corporate Information Technology	Central	Small	ICT	Software and Services	Internal
Central Innovation Process (China)	Regional	Medium	Cross	Processes	Internal

Even though we tried to achieve a large diversity, it is noticeable that within Bosch most business is targeting B2B and focuses on selling components. Also other BDs that are not listed here are active in the B2B-component sector.

Another interesting aspect visible here is that many divisions at Bosch supply other divisions and have internal customers. When it comes to crowdsourcing, this constellation can become very beneficial for crowdsourcing opinions and recommendations about a BD’s products or services.

Preparation of semi-structured interview and card sorting

The desired outcome of the first interviews was to identify the problems that the BDs are currently facing. Another goal was to get a feeling for the level of awareness and appreciation of internal CS from a perspective of the innovation managers. Our interview guide was therefore structured into the following areas:

1. *First comes-to-mind innovation problems (incl. card sorting)*
   In this section, we asked the innovation managers if they face innovation problems where they seek help from outside their BD and if they could identify a reoccurring problem pattern. For didactical reasons, we put this major question up front, to avoid framing to the innovation process and see if there are other problems pressing. We then asked the interviewees to describe their problem with the attributes we have written on the cards.
2. *Idea sources and generation of ideas*
   This section aims to analyze the first part of the innovation process, often referred as the fuzzy frontend. Here it might be interesting to see if Bosch has rather too many or to little ideas. Also the ratio of quality of ideas to quantity will be an interesting indicator to identify room for optimization.
3. *Evaluation & selection of ideas*
   This section was dealing about the evaluation of ideas that should be further processed. Potential problems here could be that the wrong person, potential bias or organizational structures that can lead to negative incentives evaluate ideas. Also the potential of crowd-intelligence for evaluation purposes was proposed in this section.
4. *Follow up (absorptive capacity)*
   The last part was dealing with the BD's absorptive capacity. We wanted to see how many new ideas a BD can process and also how much risk the BDs are willing to take in case of radical innovations. It was also analyzed if it is possible to transfer good ideas to other BDs or even outside Bosch.
5. *Identifying target groups (incl. card sorting)*
   This section was apart from Bosch's innovation process. Here we analyzed if the innovation managers can already identify certain people or target groups that are required for solving their innovation problems. For the CS application it will be important to address these people later on and provide them the right incentives to participate.
6. *Gut feeling for CS potential (only card sorting)*
   As a final task for the interviewee, we asked them to tell us their gut feeling of which CS types they would prefer most at Bosch. This task was put at last in the expectation, that the users are sensitized enough about CS to make a rational choice.

The interview has been conducted in collaboration with another Master student called Karan Shah as he was at the same time conducting his thesis about external CS solutions for Bosch. The complete interview guide can be found in the appendix, where the paragraphs that are relevant for this thesis have been highlighted.

During the interview, we had three supporting card sorting activities. As earlier mentioned, card sorting is a creative interview technique. It is often used for user experience design for software programs or website, where the users are asked to cluster similar fields of their interest together and create different categories (Schüßler et al. 2009). This technique can also be transferred to other use cases, where it is important to find clusters or patterns. One pattern could be for instance combining problems with high technological complexity with confidentiality.

Another goal of the CS activity is to trigger the creativity of the interviewees by asking them to provide reasons for their choices. Often the choices are initially a gut feeling, but when they try to explain their choice, it has been the case that they actually reconsidered their initial choice. Based on that, we could also receive a feeling of which aspects are present, but maybe not completely rational. In this activity the users had the task to categorize a set of from us defined factors and create a hierarchy for these factors. We also added some blank cards and first asked the participants to think about if something is missing.

In the following the categories of the cards are shown in the table below. Each bullet point stands for one printed card. The bar graphs within the table represent the response rate to the categories. This will be referred to in the next chapter.

The first activity was about getting an overview of what types of problems the innovation managers have and where they see a potential to use CS.

Table 8: Card sorting categories for types of innovation problems

Competency		Confidentiality		IP priority	
▪ within BD's core competency		▪ Extremely confidential		▪ high IP priority	
▪ within Bosch's core competency		▪ Highly confidential		▪ low IP priority	
▪ outside Bosch's core competency		▪ Preferably confidential		▪ unknown/undefined IP priority	
		▪ Non-confidential			
Radical / Incremental		**Technical complexity**		**Focus**	
▪ Problems targeting radical/disruptive solutions		▪ Highly technical problems		▪ Highly Focused & Well-defined challenges	
▪ Problems targeting incremental solutions		▪ Reasonably technical problems		▪ Broad & Abstract challenges	
		▪ Non-technical problems			
Type of expected solutions		**Time pressure**			
▪ Product		▪ High			
▪ Process		▪ Medium			
▪ Business Model		▪ Low			

The second card-sorting activity was about target groups. We asked the innovation managers, which target groups they think, are most suitable for participating in CS activities and which ones are not.

Table 9: Card sorting categories for target groups

Level of Interest	Level of Skill	Level of Familiarity
▪ High	▪ High	▪ High
▪ Medium	▪ Medium	▪ Medium
▪ Low	▪ Low	▪ Low
Internal Target Groups		
▪ BD wide		
▪ Other BDs		
▪ Bosch wide		
▪ External Contractors (fixed-term hires)		
▪ Communities of Practice		
▪ Retired Bosch groups		
▪ Bosch experts group		

At last, the third card sorting exercise was a wrap up of the whole activities and asked for the interviewees gut feeling to prioritize the most applicable CS types for Bosch.

Table 10: Card sorting categories for different types of CS campaigns

Different types of CS campaigns
▪ Crowdvoting
▪ Crowdsourcing of ideas / concepts
▪ Crowd collaboration / development
▪ Crowdsourcing of solutions
▪ Crowdfunding
▪ Crowdsourcing micro tasks

Analysis of interviews and card sorting activity

The analysis for the semi-structured interview was done by taking short notes during the interview. The notes were structured by the topics mentioned before. Furthermore, we grouped the answers and notes of the innovation managers by: awareness, problems and solutions. With this grouping it will be easier to keep track during the interview and later on consolidate the results all interviews.

For the card sorting, we took pictures of the final results and also if some interesting constellations of cards appeared during the exercise. Based on the order of the cards, we assigned different values:

- 2 points - for cards put first (could have been more than one)
- 1 point - for cards that are still considered
- No points - for cards that have not been considered

For the evaluation here, a visualized format has been chosen, as it is easier to create conclusions on a visualized format compared to showing the bare numbers. As a note to the visualization used above, the amplitude of the bar chart is related to amount of points each card scored during the card sorting session. The amplitude for each session is normalized. This means that the full amplitude is assigned to the card that has been mostly set on the top. The other values will be shown relatively to this maximum amplitude.

Intermediate results from interviews and card sorting

This section summarizes the most important findings from the initial interview and card sorting activity.

(1) Fuzzy frontend produces too many ideas that cannot be processed
From the interviews we could hear that there are too many ideas that cannot be handled. Especially unstructured idea sources like the suggestion box produce a vast amount of redundant or low quality ideas. Other sources like workshops are seen as more valuable as the ratio of quality to quantity is perceived as much better. From the interview: “I have never received a valuable idea from a suggestion box, as most of them are not related to our daily business. Most are related to power tools, which I sometimes forward if they seem to be promising.”

From the four process stages Bosch has in place, the following ratio has been told us as a rough estimate for the sorting out rate within the innovation pipeline:

100 – 1000x	IG0	→ 1x IG1
20x	IG1	→ 1x IG2
10x	IG2	→ 1x IG3
5x	IG3	→ 1x Series production

(2) Profitable ideas at the end of the innovation pipeline cannot be used
Also at the end of the innovation pipeline there seem to be a good amount of unused innovations. From the innovation managers we heard those even innovations that have been rated as profitable and a viable investment, the handover from an innovation study to a series production is very difficult. So even though there are good ideas on the shelf, Bosch cannot make use of it, as no BD has the capacity to adopt it.

(3) Many mid-stage innovations are related to confidentiality and IP protection
About 70% of the interviewees stated their innovations require confidentiality or should be treated preferably confidential. Furthermore, The same amount stated that IP is an important factor for this innovation.

(4) Innovation problems are from a high technical nature
About 80% of the innovation managers stated that they have the need to source highly technical problems and they see the largest benefit in this CS type. From non-technical or general topics they do not expect it to be efficient to be solved by a crowd, because they would expect too many low quality ideas, which still create a lot of effort for the CS initiator to evaluate. They rather prefer the alternative of a workshop because it would be more efficient.

(5) Innovation managers favor Crowd-voting
One unanticipated element was the recurring preference for crowd-voting before all other crowd activities. One reason why innovation managers chose this as their top-preference was their problem of having too many ideas in their innovation pipelines that need to be evaluated. They often face a lot of suggestions from the employees, where 90% can be easily sorted out, as they do not match a minimum quality level. To tackle this problem, many IMs see crowd-voting as a filter where the crowd can pre-filter the amount of ideas and only let the good idea reach the innovation process. Even though the innovation managers favor crowd-voting, they were not willing to have a democratic mechanism about the decision about which idea should be processed further. At the end they wanted to have the last say about this issue.

(6) Focus on core competencies and incremental innovations, but collaborate with others BDs competencies
Most innovation managers stated that they would like to only crowd-source problems that are in their core competency. Even though literature would suggest that CS would rather make sense to address the competencies of someone else. It becomes visible that the innovation managers would only use CS as a tool to extend their current core competencies. Also the fact that most IMs would use CS for incremental rather than radical innovations confirms this assumption. Nevertheless, almost all IMs stated that they would like to include employees from other BDs and experts from communities of practice, because they think there is a lot to gain.

(7) Difficult power position for new ideas

The last finding from the interview is the power position in order to decide upon the realization of new ideas. One out of three IMs stated that the currently implemented stage-gate process at Bosch enables some people to have a too strong of a power position to decide upon the further processing of ideas. The problem is not, that the power is used in an malevolent way, but having only one person deciding on ideas can lead to the killing of high-potential ideas, simply because the decider is not capable of changing into the appropriate perspective. One mentioned example is the case of local market adoption. It is quite difficult for someone sitting in Germany to decide on the innovation portfolio developed in Southeast Asia. This might be a second reason, why crowd-voting was something favored by the IMs, as it brings more voices into the evaluation process.

5.2. Categorization of ideas

In this section high potential ideas in the Bosch innovation pipeline will be categorized by a set of describing and contextual factors. The chosen ideas for this analysis have already reached the middle or the end of the innovation pipeline. They survived initial validation processes and will therefore have a higher potential of realization. The anticipated results of this tasks is to check if there are clusters of ideas and then decide if there are special CS types that can help to create more ideas for such a cluster, as those ideas seem to have a larger potential to be realized.

The term idea refers here to a submitted proposal that is considered to become an innovation project. Ideas can therefore be anything from an abstract concept on a piece of paper, to an already working prototype. Later we will introduce a factor called maturity, which will define how far the idea has already been taken forwards.

In the following sub-chapter first an overview of the chosen contextual factors will be provided. Secondly, the data collection and analysis method will be introduced. At last the results from this analysis will be shown.

Factors to categorize ideas

The factors to categorize the ideas have been collected from three different areas. In the following an overview of the factors that will be collected is provided.

The first two category areas are taken from a Bosch internal source, which means that the innovation managers should be already familiar with these types of categorization. The last category area was created by the author and was aiming to get more information about the ideas background, e.g. history and expected future challenges.

Classification factors

Classifies the state of the idea, e.g. state in the stage-gate process, type of innovation, type of customer.

Table 11: Overview of classification factors

Classification Factor	Description
Innovation Gate	Bosch has three innovation gates (IG). For this selection only ideas that passed the first gate IG1 have been chosen.
Type of Idea	Is the idea related to a product, service or technology?
Type of innovation	Categorization by modified Ansoff (1957) matrix, with Bosch terminology (1) Technology - existing or new (2) Market - existing or new
Target-Customer	Is the idea for a B2B, B2C or internal customer
Maturity level	How far the idea has been developed. Is it only a rough idea sketch or is already a prototype available.

The Type of innovation was used, as it is also a used instrument within Bosch where the innovation managers are familiar. Therefore, the Bosch terminology has been adopted in this thesis as well.

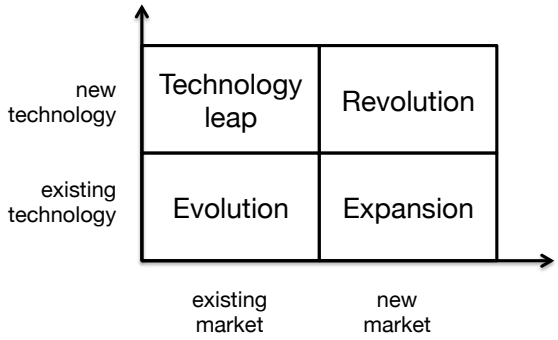

Figure 19: Modified Ansoff matrix with Bosch terminology

It is interesting that at Bosch the classification is done by *technology*, whereas the original matrix uses *product*. This is another indicator, that innovation with respect to technology is having a special position within Bosch.

Evaluation factors

Factors used to evaluate an idea. As only ideas from a later stage are analyzed, all ideas should fulfill these factors, but it will be interesting to see which of these criteria are the dominant ones.

Table 12: Overview of evaluation factors

Evaluation Factor	Description
Market novelty	How new is the market for the BD, Bosch, direct competitors or industry?
Technical novelty	How new is the technology for the BD, Bosch, direct competitors or industry?
Realization effort	How difficult is it to realize the whole idea?
Efforts to create a proof of concept / prototype	How much does it cost to create a prototype or proof of concept?
Intellectual property	How is the IP situation?
Impact Potential of Idea	How much impact would this idea have on existing products or product families?

Background factors

These factors analyze the context of how the innovation was created. For instance who came up with the innovation and who is the Champion or advocate behind this idea.

The selected factors in this section have been chosen, as they have not been answered completely during the first analysis and the interviews.

Table 13: Overview of Background factors

Background Factor	Description
Biggest Challenge	What is the biggest challenge for this idea? This question was added to see if there is a pattern for ideas that are either challenged by the market uncertainty, technical feasibility or the availability of internal resources. The later on defined CS types could help to solve some of these challenges.
Confidentiality	How confidential is the idea? This question should help to provide an overview of how many innovations are considered confidential within Bosch, and which ones aren't.
Source of innovation	Who came up with the idea? This question should help to understand where the sources if innovation in the innovation process are coming from. There might be a significant different between ideas submitted from bottom-up and top-down.
"Champion" behind the idea	Who is protecting the idea from being stopped? This question should help to understand if a champion is needed to protect an initial idea and to provide a protected environment for letting it grow.
When do you personally think the idea will be realized?	Question to be answered by the gut feeling of the interviewee
Do you personally think the idea will be realized at all?	Question to be answered by the gut feeling of the interviewee

Data collection and analysis method

The information was collected by sending out a survey in form of an excel sheet. Most of the times, the questionnaire was filled out together with the participants, either via phone or in person next to them. With that, it was possible to receive more background information while the participants were filling out the factors and providing arguments for their choice.

For each factor there was a set of answer possibilities provided, and either formed a nominal or ordinal scale. If the provided answer possibilities did not fit the answer the interviewee wanted to provide, there was a possibility to answer in a free text area. These answers could later on be either consolidated into the provided scales or in case it was a special circumstance they could be left out for the analysis. But at the end, the usage of the free text area was not the case. The list of potential answer possibilities is attached in the appendix.

In total the survey was able to collect 21 ideas from 7 different innovation managers. The amount of time and the availability of the innovation managers was the limiting factor to these numbers. The data collected forms a high dimensional dataset with 17 dimensions, while having a small amount of samples. Because of this it is not possible to evaluate this dataset statistically. Therefore, the choice to evaluate this data was to focus on data visualization techniques. Also as this phase is still explorative, data visualization is a good method to identify patterns and new insights from data, without relaying too much on the constraints from statistics. The validity of these identified insights is in turn very low and needs to be proved in another future validation.

Scatterplot matrices and parallel coordinates are visualization techniques for high dimensional data. The advantage of a scatterplot matrix compared to the parallel coordinates is that clusters and correlations are easier to identify, which is why it is more suitable for this data set.

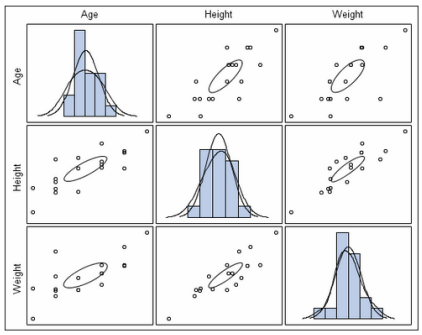

Figure 15a: Example of scatterplot matrix

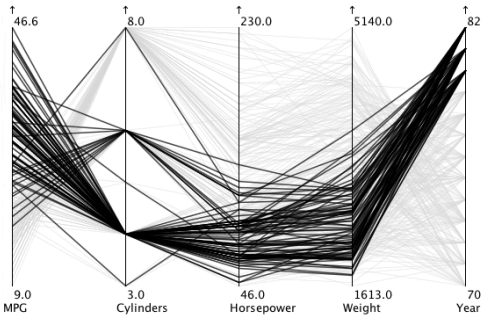

Figure 15b: Example of parallel coordinates

There are some commercial tools and open source tools available, e.g. GGobi, to create such scatter plot matrices. But for this data set a customized tool was created, as the data set mostly consisted out of nominal and ordinal data, which is difficult or not intended to be processed by the available tools. For instance most tools do not show values of the nominal and ordinal scale in their visualization and make it difficult to select and un-select factors that should be compared.

The visualization tool was created via D3js (2014), a JavaScript visualization framework, and combined a scatterplot matrix with a bubble chart. With the bubble chart character it is possible to visualize if values appeared multiple times, which is often the case on nominal and ordinal scales. The following figure shows how the visualization and exploration tool looked like.

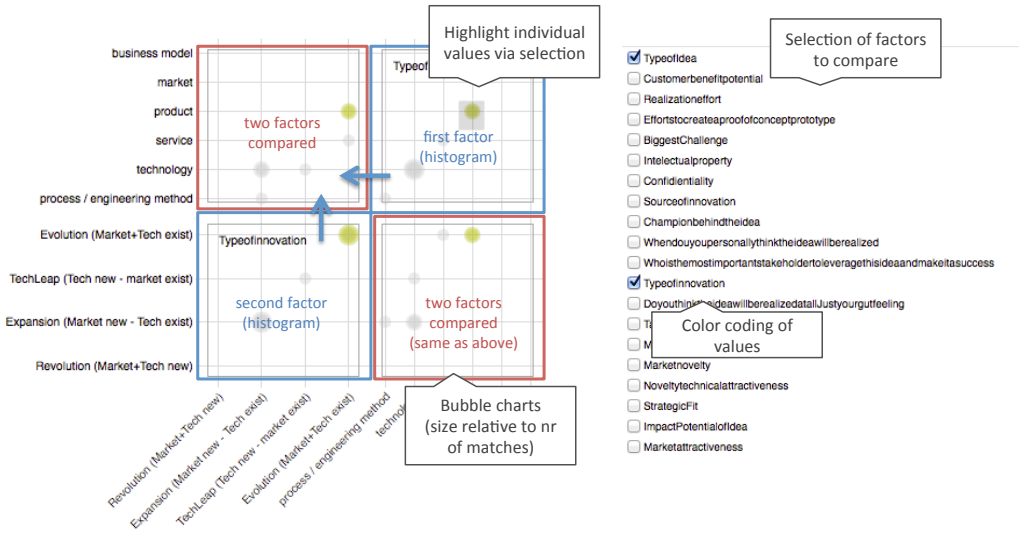

Figure 20: Visualization tool to explore idea categories

After reading in the dataset, the tool will show a list of factors that can be selected via checkbox. Depending on how many factors have been selected, an N x N matrix is drawn that will display the data in form of a scatterplot matrix with bubble chart character. Then it is also possible to select individual data entries in the plot with the mouse, which will then highlight the selected data entry in each of the matrix squares.

Intermediate results from categorization

In this chapter the findings from the visual analysis will be presented. There are three major findings. The numeration of the findings will continue from the findings mentioned in the last chapter.

(8) Innovations are triggered bottom-up from developers and teams and focus on technology leap

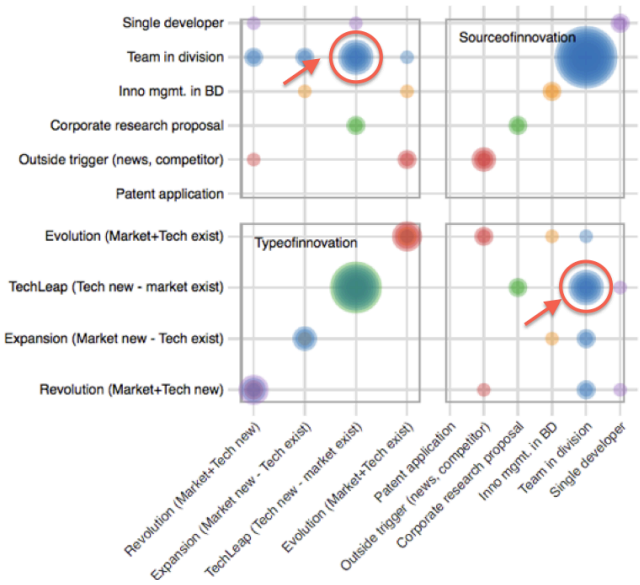

Figure 21: Correlation of type of idea vs. source of innovation

As visible in this graph, the teams in a BD (labeled blue) are responsible for a largest amount of ideas. Also the most developed type of idea is related to technology leap innovations. For a CS campaign, this could be a very specialized use case, to focus on the bottom-up innovations developed in the teams with the goal to produce technological innovations more efficiently.

(9) Ideas need to have a high maturity level

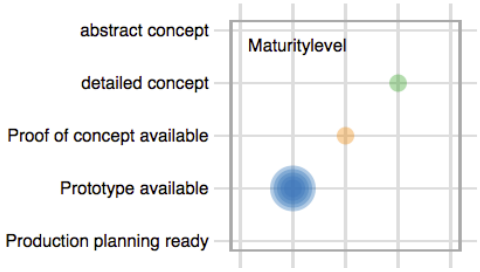

Figure 22: Maturity level of ideas

Most ideas that have reached the early innovation pipeline have already developed a prototype. From the interviews, it turned out that for those ideas a lot of development have been used, but without having any resources allocated for the development. Often the development happened secretly in a team unit and after they reached a prototype stage they applied for resources via the innovation process. The initial risk to develop

this prototype was carried by the individual team, or the team manager. Having this protected space to grow an idea is something the CS system should also anticipate. It seems that most teams within Bosch are allowing such projects and carry the risk, but there were also some voices from the previous interview that indicated that this is not everywhere the case. Especially in countries with a high-power distance and risk-aversion, creating such a secret space can be more difficult.

(10) Technology leap ideas are often confidential and aim for IP protection

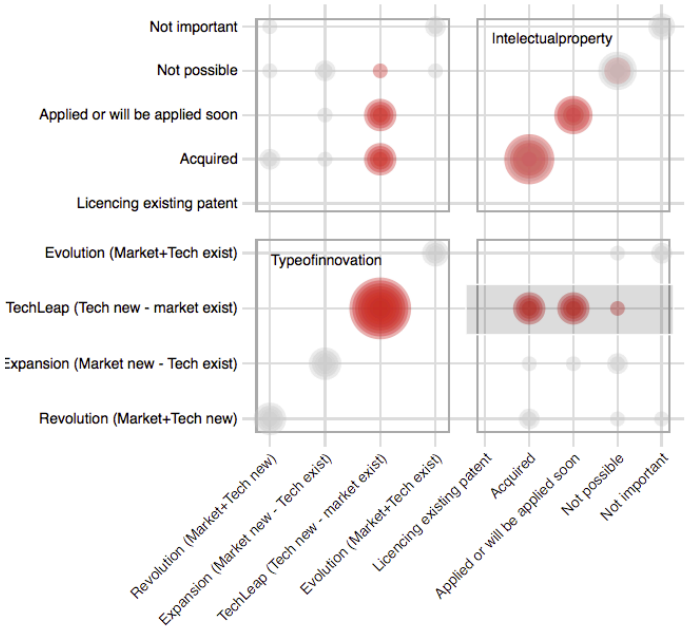

Figure 23: Technological ideas correlate with IP protection

In this chart we can see that the technology leap ideas (labeled red) correlates with IP protection. This confirms the finding from the interview, that IP and confidentiality are a pressing issue at Bosch.

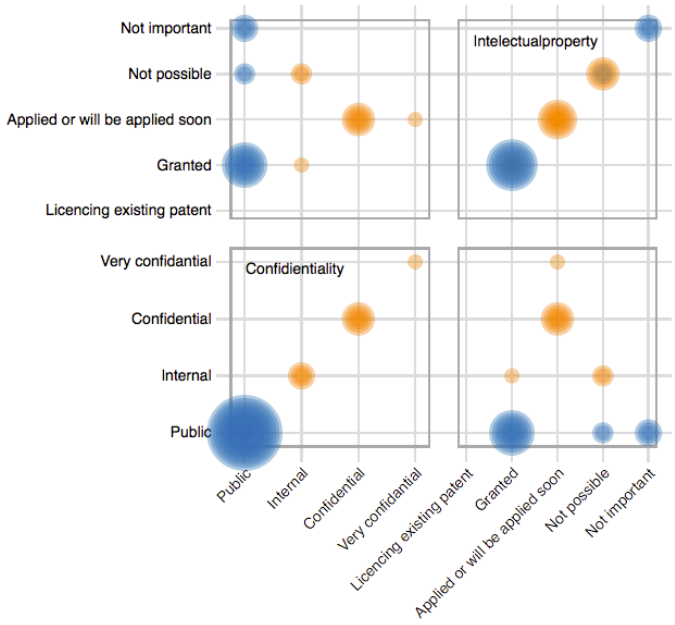

Figure 24: IP situation correlate with confidentiality

The confidentiality often results from a patent that is not released at that moment which requires the innovation to be confidential. As soon as the patent is granted, the idea will lose its confidentiality state and become public (here labeled blue).

Such an implications also need to be considered for the design of a CS system. For instance it should be possible to convert submitted ideas into patents if they can provide new IP. Also due to confidentiality, it should be possible to hide ideas from the general crowd and directly send it to the initiator of a CS campaign for review, in case the inventor expects that his idea is about to create new IP.

5.3. Combination of results

At Bosch ideas related to technology have a special position. There are many innovation problems that are related to technological problems, as well as there are many ideas that are related to solving them. These technological ideas and problems often imply special treatments with respect to confidentiality and IP protection. Also the key-findings (3) and (4) confirm these statements.

> *(3) Many mid-stage innovations are related to confidentiality and IP protection*
> *(4) Innovation problems are from a high technical nature*

Furthermore in key-findings (6) and (10) it is shown that most ideas at Bosch are incremental, technology leap and therefore fall into this category.

(6) Focus on core competencies and incremental innovations, but collaborate with others BDs competencies
(10) Technology leap ideas are often confidential and aim for IP protection

Therefore it would be reasonable to treat technological ideas as a special CS type (CST). In the following this first CST will be referred as expert sourcing for technological solutions, or shortly **expert sourcing**.

The second type of potential CS campaign should be about collecting idea without this technological focus and therefore not fall into the expert sourcing case. The goal of this CS type is also to take care of the key-findings from the previous analysis. For instance it is mentioned in key-findings (1) and (5) that there are too many ideas generated in the idea frontend, therefore this type needs to enable some form of crowd-filter to filter out the ideas with a lower quality.

(1) Fuzzy frontend produces too many ideas that cannot be processed
(5) Innovation managers favor Crowd-voting

Secondly, this CS type should create a more democratic environment. As shown by key-findings (2) and (7), many innovation managers would like to enable crowd-voting to overcome difficult power positions at Bosch and also to make it possible to give ideas that have been rejected a second opinion.

(2) Profitable ideas at the end of the innovation pipeline cannot be used
(7) Difficult power position for new ideas

The second case of CS campaign will later on be referred as Crowd sourcing for ideas and suggestions, or shortly **Idea sourcing**.

The last two key-findings from the analysis (8) and (9) from the analysis can be relevant for both CS type.

(8) Innovations are triggered bottom-up from developers
(9) Ideas need to have a high maturity level

Key-finding (8) indicates that within Bosch there is still a large potential for innovations, that is triggered by the teams and the individual employees. Also from the interviews we heard that it is not a key issue to motivate the employees to bring up new ideas, it is

rather important to channel their ideas properly and align them with the corporate strategy so that the employee's innovation efforts are not going to waste. Therefore, as a requirement for all CS types within Bosch, the challenges the CS system places to the employees should not be too open, as it will be very likely to produce too many not usable answers. This issue is implicitly solved for expert sourcing CS type as we will see later, but for idea sourcing it will be relevant to carefully refine the problem or challenge that is broadcasted to the crowd.

The last key-finding (9) that ideas need a high maturity level puts a difficult requirement on both CS systems. On the one hand, as shown in the literature review, it is not possible for employees to invest a large amount of their time on the CS platforms as they are responsible for their daily business activities, but on the other hand it is shown that mature ideas have a better change for realization. This tradeoff will become a challenge for each internal CS system. A staged approach could be viable solution, but here it needs to be checked if the stages of Bosch's innovation process are too huge, or if some micro-stages during the CS process need to be included.

Finally only two categories have been identified that seem to fit the Bosch context best. But when should either one of these types be used? In the following we will characterize the type of innovation problem where the CS type can be applied most efficiently. It would be possible to identify more types of potential CS activities. For instance having a CS type only for voting and discussion. But at this point the collected data set did not offer any other significant insights to support more types. Whereas for expert sourcing and idea sourcing, there have been many clues from the interviews and also the collected data about the innovations in the innovation pipeline. The result from the card-sorting session, that the innovation managers favored crowd-voting will nevertheless be recognized as an essential part of ideas sourcing,

In the following graphic an overview of the two types related to Bosch's innovation process is shown. Idea sourcing is rather related to be place in the very frontend of the process where ideas are generated. Indicated by the graphic is that this idea generation part is after Bosch's strategic innovation area's part, which means that the idea generation has to be aligned with Bosch's strategic innovation fields. Expert sourcing instead is rather focusing on finding solutions to existing problems. Therefore, this type of CS is rather likely to be found somewhere after the idea has already been generated, which is somewhere in the middle of the innovation process. At last, there is also indicated that idea sourcing could be used as some form of crowd-voting, which could

help to make the innovation process somewhat more democratic from the employees' perspective. It would be an interesting approach to have the employees decides about some future innovation projects that should be taken to series, but also here confidentiality and the power position within Bosch will make this scenario not very likely.

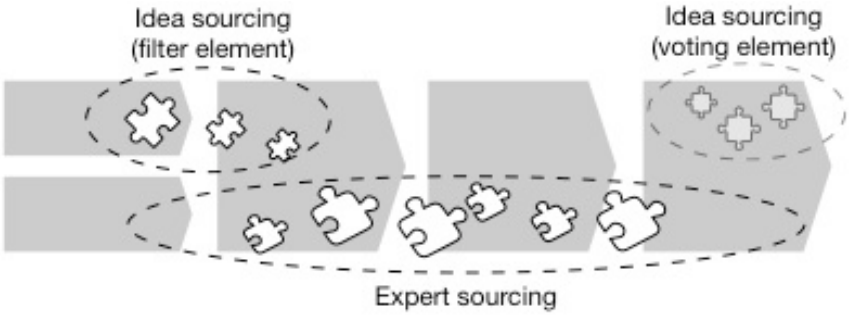

Figure 25: CS types located in Bosch's innovation process

CST 1: Expert sourcing

The objective of this CS type is finding solutions to a specific problem by identifying and bringing together the experts that are most likely to solve these issues.

Another way to explain when expert sourcing should be used can be illustrated by referring to the long tail of knowledge theory. For highly technical problems, the largest part of knowledge remains only within the experts and not within the general crowd. Figure 26 illustrates this phenomenon. As an example, when it comes to problems about "soldering aluminum with cooper", it is unlikely to find knowledge about this topic spread over the general crowd. Therefore, it will be more valuable to identify one expert within the company to this topic than asking 10 non-experts that even have problems in understanding the actual problem. Therefore, for expert sourcing one main tasks of the CS type is to identify these experts and connect them with each other.

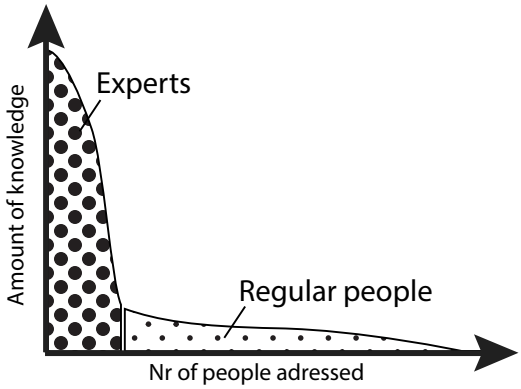

Figure 26: Problems with a long tail of knowledge distribution suitable for expert sourcing

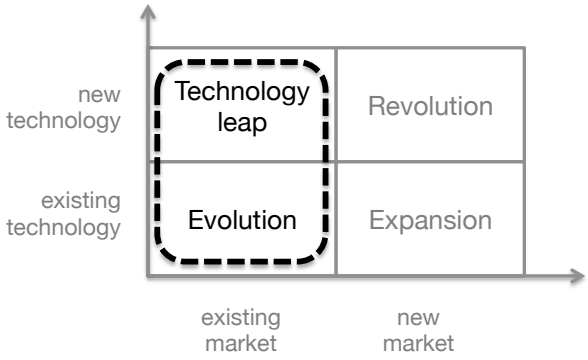

Figure 27: Types of ideas produced by expert sourcing

The results of this CS type are likely to yield new technological leap innovations, as these technical problems are likely to be raised from the development of existing products. Another type of idea created by these campaigns can be related to process improvements, manufacturing technologies or new engineering tools and methods. Relating this to the Ansoff matrix, the produced innovations are most likely to remain in the technology leap and the evolution quadrant.

As shown by the second part of the analysis, these types of innovations are often related to confidentiality or IP issues, which is why this type of CS needs to take this into account.

In the following a list of benefits and a list of possible alternatives for expert sourcing are provided.

Benefits of expert sourcing:

- Get insights from experts over various GBs, which increases probability to solve the problem if it cannot be solved within the GB
- Building personal connections within the experts during a CS campaign will benefit them in the future
- Less problems with confidentiality and IP as the addressed crowd is rather small
- More resource efficient than using an external platform
  (e.g. Innocentive charges about 10 000 € per campaign)

Alternatives to expert sourcing:

- Instead of CS campaigns also workshops with experts could be set up. But this is only possible if the experts are already identified and have the required knowledge. A CS approach allows the problem owner to reach out for expertise from different BDs and locations, which can help to solve problems that could not be solved with the experts from an individual BD. Workshops or ad-hoc phone calls are the more efficient way for solving technical problems, so CS should only be used if the results of these workshops were not sufficient.

- If the internal CS campaign did not lead to any success, there is still the possibility to go external, e.g. InnoCentive. When doing an internal campaign, many steps are similar to external campaigns, which will make it later easier to transform an internal export sourcing campaign to an external campaign if the results were not satisfying enough.

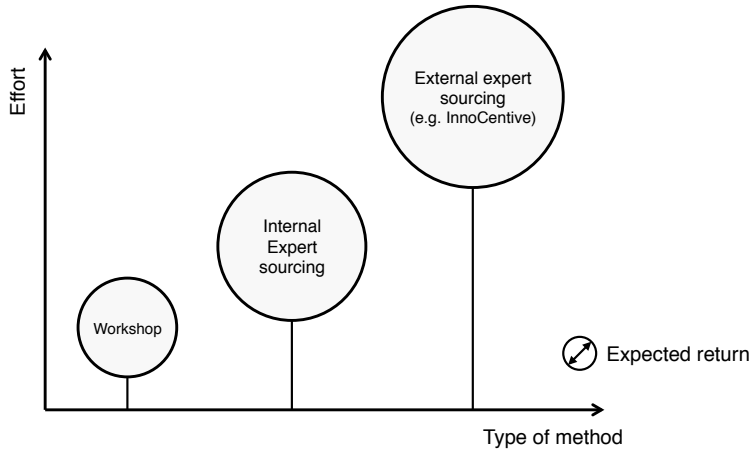

Figure 28: Alternatives to expert sourcing with respect on effort and expected return

To summarize the nature of this CS type, the table below is mapping expert sourcing to the typologies introduced in the literature review.

Table 14: Expert sourcing mapped to typologies from literature review

Typologies	Resulting Type	Description
Type of Crowd	(1) Trusted (2) Qualified	For expert sourcing a trusted and pre-qualified crowd (experts) is needed. Trusted can in this case even mean to define NDAs before assigning one of them to a case.
Task	Crowd-Intelligence Crowd-Voting	The type of task will only include giving their knowledge and rate others opinion. Crowd-creation as open source should be avoided, as it would disturb them too much from their daily business activities.
	Complex Tasks	The task should not be simple as it would be inefficient to contact experts for something like that. Creative tasks have been excluded, as it would make sense to include also non-experts for creative tasks, as the solution space is much wider.
	Rating Creation Solving	There the rating part is related to crowd-voting as mentioned above. The creation part means that participants can work on submitted ideas together (e.g. comments, tips for improvement), whereas solving means that one person submits a solution without showing it to the others. For expert sourcing both ways should be possible, as it is likely to expect submissions that can easily transferred into IP.
Initiator	Bottom-up Direct submission	The initiators of such CS challenges are mostly experts and not part of the management. As this type is about sourcing for solutions for complex and technical problems, only the experts would exactly know what the problem is and where it comes from. For this CS type, not necessary a platform mediator is required, as the amount of users that is addressed is small and specifically selected. Therefore the initiator should be able to directly submit his problem to the platform.
Problem	Crowdsourced Problem Solving	Related to the task typology as shown above, this type of CS falls clearly into the Crowdsourced Problem Solving (Howe 2006). Therefore later on we will also make use of best practice guides around this type to compile a Bosch specific best practice guide.
Type of call	(1) Invitational (2) Directed	The type of call for this type is clearly invitational, meaning that people get selectively invited (or not) to a specific challenge. Here the prerequisite for an invitation is a sufficient level of qualification. Secondly, the type of call is directed, meaning that a specific problem is at stake that needs to be solved. Meaning that the solution space must be narrowed.
Used medium	Online	The preferred medium for this CS type is online, as it is expected that the experts are distributed over various locations within the MNO.

The factors about motivation and process are elaborated on later in the framework chapter.

CST 2: Idea sourcing

The objective of this CS type is to retrieve ideas, suggestions or opinions from a large heterogeneous crowd within the company. Idea sourcing is probably the most prominent type of CS that is applied in companies nowadays, e.g. Dell Idea storm or IBM idea jams. It is also very closely related to the idea management system within a company.

Relating idea sourcing to the long tail of knowledge theory, it is most suitable for problems where the knowledge is widely distributed across the crowd. Figure 29 illustrates this phenomenon. Such a distribution is often the case when having very abstract or broad questions or problems.

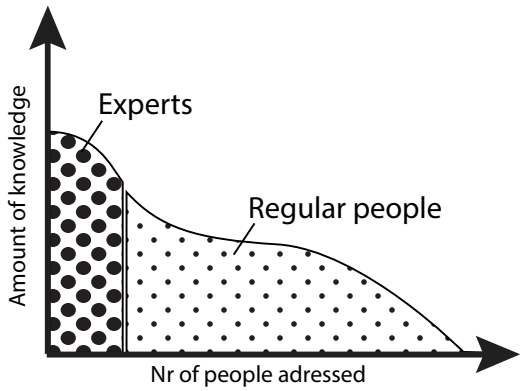

Figure 29: Problems with a long tail of knowledge distribution suitable for idea sourcing

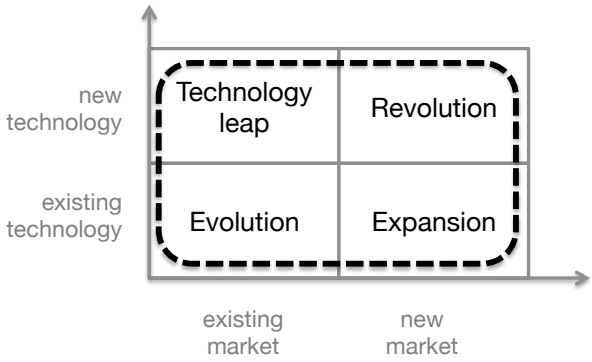

Figure 30: Types of ideas produced by idea sourcing

An example for this type of problems mentioned by one of the innovation managers was: “How can Bosch benefit from the robotics industry?”. For such questions there are also experts available, e.g. technology managers. But also when asking the general crowd, there will be many good ideas, as they will have many perspectives on this developing field. Also the chance of serendipity is given here, as one of the employees might come up with a good idea due to a special background. This way of thinking includes a lot of assumptions, but at the end it is also a matter of statistics and the chance to have a scenario like this happen increases with the amount of people addressed.

Another use case that is applicable to this CS type is that at Bosch there are many problems that concern the employees, e.g. if the central IT department is planning to role out a new office software suite or if the HR department is planning to introduce a new working concept that aims to offer the employees more flexibility. In such cases the

employee's opinions are very valuable as they are the ones that will be affected. For such types of problems, this CS type can perform as a concept pre-validation, where the users can rate or extend the suggested changes.

The types of ideas produced by these campaigns can be anything from technological to market innovations, depending on the description of the problem to be solved. Relating this to the Ansoff matrix means that these ideas can lay in any of the quadrants as shown in Figure 30.

One of the biggest doubts many innovation managers had with respect to idea sourcing is that the required effort to do such a campaign does not yield sufficient results. The preparation efforts of CS, the moderation efforts during the campaign and at last the evaluation efforts are in sum much higher than organizing multiple workshops. Nevertheless, I included this type of CS as a suitable option for Bosch as this type includes intangible benefits. These benefits are related to fostering a better innovation culture at Bosch, as it enables and encourages people to work together over various BDs, which help to break up the silos within Bosch. Another reason is that this CS type can be used to communicate and align the employees with the corporate strategy and even giving them the possibility to influence it. This improves the collectivity feeling of the employees and increases the bond with the company.

In the following a list of benefits and a list of possible alternatives for expert sourcing are provided.

Benefits of idea sourcing:

- A very large and more heterogeneous group of people can be addressed that can offer insights and suggestions from different perspectives.
- Due to the virtual collaboration style employees from different locations can be reached.
- The crowd can evaluate and pre-filter submitted ideas, which reduce the effort for the final reviewer as they then have to evaluate the best ideas.
- Employees feel more aligned with the company's strategy as they have the chance to influence it at this point.
- By having many colleagues working together it also set a symbol for open collaboration, which has a positive influence on the company's innovation culture and reduces silo behavior.

Alternatives to idea sourcing:

- Also for this CS type, workshops are an alternative, which could be more efficient in most cases. CS campaigns require more effort than setting up a workshop, but depending on the kind of problem to be solved CS campaigns can offer more valuable results. This is something that has to be decided from case to case. The more an innovation problem can benefit from a heterogeneous crowd, the more it is suitable for a CS campaign. Also if the CS campaign is aiming to communicate the business strategy to the employees, it might be an efficient promotion tool. At all, this CS type should be used only occasionally, as the more often it is used, the less the employees will participate on each individual campaign.

- Also surveys can be used to integrate the employee's opinions. A survey is useful for analyzing the current state and also give the employees the feeling that their opinion matters. Whereas CS gives the employees the possibility to actually influence the current state. Survey's can be evaluated with statistics, whereas a CS campaign will provide a very diverse range of answers.

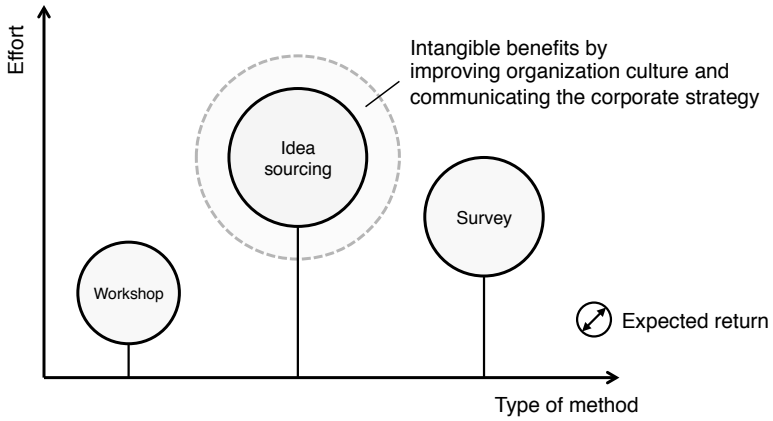

Figure 31: Alternatives to idea sourcing with respect on effort and expected return

To summarize this CS type, the table below is mapping idea sourcing to the typologies introduced in the literature review.

Table 15: Idea sourcing mapped to typologies from literature review

Factors derived	Resulting factors	Description
Type of Crowd	(1) Public (2) Public	In this case we neither would expect a trusted nor pre-qualified crowd. We could argue that in case of internal CS the crowd is trusted implicitly, but compared to expert sourcing the amount of trust needs to be lower.
Task	Crowd-Intelligence Crowd-Voting	The type of task will only include giving their knowledge and rate others opinion. Crowd-creation as open source should be avoided, as it would disturb them too much from their daily business activities.
	Creative Tasks	For idea sourcing the task should be creative, meaning that it provides a large enough solution space. The long tail of knowledge theory and serendipity would suggest working best on a large crowd, if the solution space if big enough.
	Rating Creation	In contrast to expert sourcing, "solving" as defined by this typology should be avoided here. Introducing Idea sourcing is often related to a company's mission to leap towards an open innovation culture, therefore the type of collaboration should not allow individual and silent submissions.
Initiator	Top-down Platform mediator	As mentioned before, idea sourcing is related to a company's vision of creating a more open innovation culture. Therefore, the type of challenges should be related to a company's future vision and therefore is likely to be initiated by the top management. As a large crowd is addressed with such an initiative a platform mediator should be consulted, which can support the launch of such a CS campaign with expertise.
Problem	Crowdsourcing Idea Game	Related to the task typology as shown above, this type of CS falls into the Crowdsourcing Idea Game (Howe 2006). Therefore later on we will also make use of best practice guides around this type to compile a Bosch specific best practice guide.
Type of call	(1) Participative (2) Directed	The type of call for idea sourcing is participative instead of invitational. Meaning that a broadcast call to every participant is used and every employee has the possibility to participate. As an important factor here, the call should be still directed. As mentioned in the interviews, the amount of unstructured ideas is already large enough; there is no need to create another channel for unstructured solutions. Therefore, every idea sourcing campaign needs to be very specific and hosted under a special theme.
Used medium	Online Offline Physical touch points	As one of the goals of idea sourcing campaigns is to work on the company culture, it is necessary to address as many people as possible. Therefore using multiple channels of communication would be a way to achieve this goal.

6. Design of crowdsourcing framework

In this chapter a framework will be designed to describe how the two identified CS types should be implemented at Bosch. The framework should meet following objectives:

- The framework should codify the information found in literature and during the interviews
- The important aspects of a CS type need to be described in a way that people not familiar with CS will understand how to implement a CS process for their type of problem.
- The framework should be able to describe different kind of CS campaigns and there should be the possibility to see how these campaigns differ in their nature. Seeing the differences in two campaigns can help people to understand what is important for their type of campaign.
- There should be the possibility to later on extend the framework with other CS types.

6.1. Structure of the framework

Most CS activities can be seen as a process, as they have a starting and an end point. There are some CS types e.g. Wikipedia that are continuous and no end is defined, but for most CS activities and also the two CS types that have been identified in the analysis a process is present.

In the literature review, we have introduced two process descriptions for CS. The framework created here will adopt the five step process described in Gassmann et al. (2014). The difference between Gassmann and Vukovic is that Gassmann separates the evaluation of results and the utilization of results. Both steps seem to be from a high relevance for Bosch, therefore it would make more split up the process step in our case and describe them separately.

Having this underlying process should help the reader to understand the information in a better context. It also breaks up the amount of information into several parts, which make it as well easier for the reader to understand. The following process steps will be used:

- **Define**
  This step describes which aspect for a CS type should be defined before starting a CS campaign.
- **Initiate and promote**
  In this step the invitation of the participants, the promotion and kick-off of a CS campaign is handled.
- **Run**
  This steps describes the how the participants are ought to contribute to a running campaign. Also the tasks that appear during a campaign, e.g. moderation are part of this phase.
- **Evaluate and select**
  In this phase the submitted ideas and solution need to be selected and evaluated. The crowd can be used to vote and rate the ideas.
- **Close**
  This step describes how to end a CS campaign in the right way. It also describes how the ideas can be taken forward for realization.

For each process step there are now several factors to be described. To provide the reader some help, it would help to have a substructure under each process. Inspired by the work of Estelles-Arolas et al. (2012) that has been used in this literature analysis, we could structure each activity during the process steps into factors from the human / participants side, the organization / initiator side and at last a methodological / process side

- **Human**
  This category summarizes all factors that are related to the participants. One very important factor is the motivational aspects of CS types.
- **Organization**
  This category combines the factors that are related to the initiator and the organization.
- **Tool / Method**
  This category describes the tooling and methodological aspects of a CS type. For instance the medium of communication is neither related to the human nor organizational aspects.

The following figure illustrates the framework. For each process step, there should be a set of factors that are important from a human, organizational or tooling perspective.

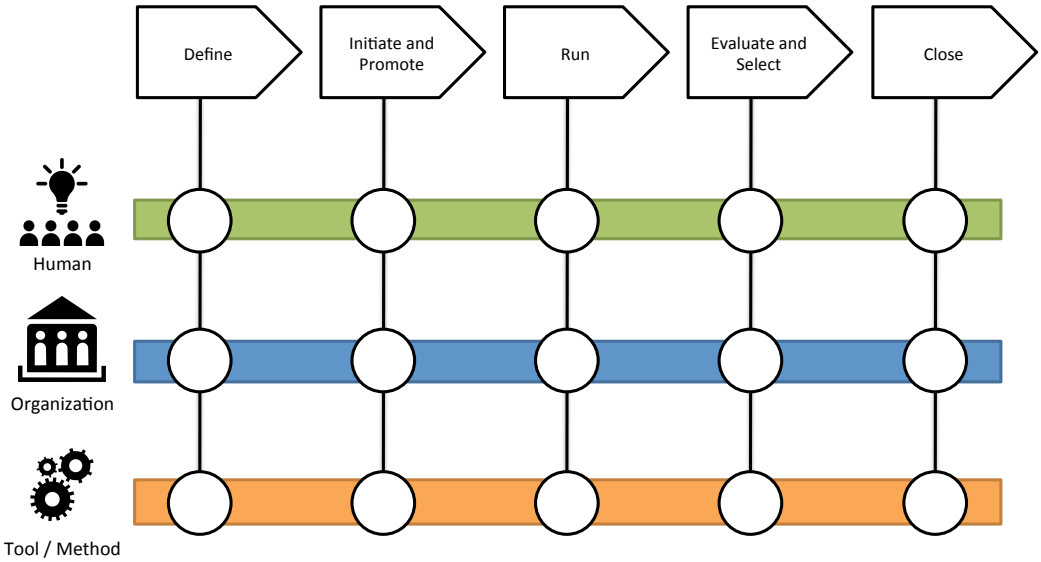

Figure 32: Framework illustration

6.2. Application of the framework to the identified CS types

The framework introduced should now be applied to the two identified CS types, expert sourcing and idea sourcing. First we will summarize a list of factors that are relevant to be mentioned for these two CS types. Later on the author will provide recommendations on how to implement these factors in the Bosch context.

The following factors for the framework are extracted from some best practices guides that are relevant for idea sourcing and expert sourcing. The best practices are only introduced here and not in the literature review chapter, as it was not clear which CS types are suitable for Bosch at that time. For idea sourcing a valuable source for best practices has been Sloane (2011), Bartl (2010), Holloman (2013) and also Bosch internal documents about CS. For expert sourcing the best practice guides from Innocentive and 9sigma were very helpful (9sigma 2014; Innocentive 2014b).

Phase 1: Define

This phase is about defining an individual CS challenge for a CS type. Therefore, we have to find out a set of factors that are important for this process step.

Target group: This factor is related to “Who forms the crowd?” in our literature. It is important to clarify this factor for each CS challenge as it is closely related to the motivation of the crowd and their willingness to participate.

Sponsor / Problem owner: This factor is related to “Who is the initiator?” from the literature review. Depending on the CS type and the individual challenge it can make sense to have someone from the top-level or a technical expert acting as a sponsor. Also here this factor can influence the participant’s motivation to participate.

IP strategy: Before running a CS challenge the IP strategy needs to be defined and communicated. This factor is derived from the literature chapter 2.4, as it turned out to be one of the common roadblocks in organizations to adopt CS.

Description of CS challenge: The description of a CS challenge is a very crucial part. It is described in Gassmann et al. (2014) and Vukovic (2009) as a very specific step for CS. Also Sloane (2011) in his book about CS spend one complete chapter only how to describe a CS challenge for the crowd.

Timeframe for challenge: Also this factor is often mentioned in the best practices for CS challenges. Also depending on the type of CS and the individual CS campaign this can influence the final success (Sloane 2011).

Expected outcome: Related to the timeframe for the CS challenge, it is a best practice to clearly define the expected outcome of submitted solutions, as this can be a factor to control quantity over quality (9sigma 2014).

Phase 2: Initiate and Promote

The goal of this step is to raise awareness of the CS challenge and promote it to the target group that is intended to participate.

Invitations: The way people are invited is closely linked to the factor in the literature referred as “Type of Call”. Either the users are invited directly or the CS challenge is promoted via a broadcast call.

Kick-off: As a best practice for idea sourcing a kick-off celebration can help to motivate participants and also act as a marketing event.

Top management support: This factor is related to chapter 2.4 in the literature review. There are many roadblocks within organizations that need to be addressed and also openly communicated by the top management when a CS system is rolled out.

Advocates: Having advocates to promote a CS challenge is a best practice mentioned in all best practice guides. It helps to create a critical mass for CS participants.

Promotion channels: This factor is related to the literature review "used medium". Depending on the type and magnitude of a CS challenge it makes sense to use a combination of offline and online channels for promotion purposes.

Phase 3: Run

This process step describes the factors that are important when the CS challenge is running.

Way of collaboration: This factor defines how the participants should collaborate. This factor is related to the "type of task" mentioned in the literature review. Is the task related to only submitting ideas individually and anonymously or is it intended to collaborate on ideas.

Motivation to participate: This part is directly linked to the motivation chapter in the literature review. What motivation should the target group have to participate? It must be the right combination out of intrinsic and extrinsic factors.

Incentives: The incentives are as well related to the motivation of the participants. Therefore, the incentives should try to attract people that are intended to be the target group.

Seeding: One of the best practices for starting new campaigns is seeding. This means to pre-populate expected answers and contributions. This lowers the fear of the participants to be first and maybe be in the spotlight as a first submitter (Sloane 2011).

Moderation: Mentioned in most best practice documents, every CS campaign requires moderation efforts to steer the participants into the right direction and avoid conflicts or confusion within the participants (Holloman 2013).

Ease of use: This factor is not mentioned in the best-practice guides, but was unexpectedly often mentioned during the interviews with the innovation managers at Bosch. As in large corporates there are several tools available, learning a new tool becomes a burden for each employee. Therefore, the ease of use and the appeal of the interface should be something to make as pleasant as possible.

Phase 4: Evaluate and select

In this phase the submitted ideas and solution need to be selected and evaluated. The crowd can be used to vote and rate the ideas.

Crowd-voting / -rating: This factor is a special form from the “type of task” as mentioned in the literature review. Most CS types include some form of voting or rating by the crowd, therefore it is included here as a separate factor.

Evaluation and selection: To define before a CS campaign how the submissions will be evaluate and selected is a best practice mentioned in every guide. It is closely liked to the “Expected outcome” factor. Important here is the level of democracy, meaning how much does the crowd finally have to say.

Feedback: A best practice to keep CS campaigns within a company alive is to provide feedback to every participant and submission. This factor is related to stimulate the participant’s motivation as a form of appreciation and recognition.

Phase 5: Close

This step describes what needs to be done at the end of a CS campaign to one the one hand utilize the ideas in a good way and to ensure future participation new CS campaigns.

Finalize: Similar to starting the CS campaign with a kick-off, there should be an event to end a campaign. The key objective of this event is again to acknowledge the efforts of the participants

Handover: This factors needs to clarify how the submitted ideas will be utilized in the future. There should be a default scenario be planned before starting the CS campaign.

But also looking at each submitted idea individually might provide creative solutions how to continue with them, e.g. starting an open source / hardware project (Sloane 2011).

Documentation: As a best practice for most CS campaigns, everything should be documented. This could be used later on to find redundant ideas in the project portfolio, resolve fights over IP and also to improve the best practices about CS within the company over time. Also creating success stories is something that can help to stimulate people to participate in future campaigns (Sloane 2011).

In the following table an overview of the above best practice points.

Table 16: Implementation of framework for expert and idea sourcing

	Define	Initiate and Promote	Run	Evaluate and select	Close
Human	◆ Target group	◆ Invitations ◆ Kick-off	◆ Way of collaboration ◆ Motivators to participate	◆ Crowdvoting / Crowdrating	◆ Finalize
Organizational	◆ Sponsor / Problem owner ◆ IP Strategy	◆ Top MGMT support ◆ Advocats	◆ Incentives	◆ Evaluation and selection ◆ Feedback	◆ Handover
Tooling / Method	◆ Description of challenge ◆ Timeframe for challenge ◆ Expected outcome	◆ Promotion channels	◆ Seeding ◆ Moderation ◆ Ease of use		◆ Documentation

For each of these factors, the author of this thesis has created an implementation advice that was intended to fit best for the Bosch environment. The advice will highlight the differences between idea sourcing and expert sourcing.

An example for one factor - Phase 1: Define (Target group) – is listed below. For each factor in the above list such an advice has been generated. The complete practice guide for idea sourcing and expert sourcing within the Bosch context is attached in the appendix. The data mentioned there will later on be used at Bosch to create a booklet for innovation managers at Bosch, serving as teaching material.

Table 17: Example of best practice guide element

Define Target Group	**Idea sourcing:** In this case a large heterogeneous crowd should be addressed (> 100). As the nature of this challenge should have many potential answer possibilities, different perspectives will improve the solving process. Therefore it would be good to invite a wider range of divisions and people from different functions and locations. If a BD has internal customers, which is the case for internal services but also for some B2B components, they form a valuable target group and should be included. **Expert sourcing:** In this case, the target group should consist out of a small group of specialists (10 - 100) that have a minimum of knowledge for being able to provide input to the CS challenge. Nevertheless, also experts from related fields should also be addressed. It is often the case that technical problems have many causes. For instance when a control system is not working, the problem could be related to the sensors, the signal processing, control parameters, actuators etc. The biggest challenge here is to identify these experts, as they are often spread all over the company. Some approaches let the users fill in some fields and tags of their expertise, which could be evaluated by the tool. Some more advanced approached use data mining and prediction techniques and analyze the employee's content submitted in the enterprise social media or other channels to identify their expertise.

6.3. Conclusion

With the framework it was possible to codify the information of the two CS types and their implementation details. For some factors it is difficult to decide weather they belong to human, organization or tool/method, which does not form a problem, as long as the factor is assigned consistently in both CS types.

When using the framework, creating the first CS type, idea sourcing, was relatively difficult, as there has been not much content available. The factors introduced here were collected from different best practice guides available, but it cannot be promised if all important factors have been collected. But we could also the question if that is actually something that should be achieved at this moment. As earlier mentioned, CS requires a fit of a multitude of variables to be beneficial, so for a new context as Bosch in this examples, it might be not possible anyhow to the best solution at this point in time. It

will need iterations and revisions of this initial framework to later on become valuable within Bosch.

Moreover, thinking in the process way and trying to think what each perspective can contribute to this process step helped to identify the initial set of factors and having included the first CS type, the framework offered guidance as it was easy to relate the factors identified in the first type towards the second.

To sum it up, the framework was a helpful way to consolidate and conserve the knowledge that has been collected in the initial research phases. Especially the information that was often communicated in a more indirect way during the interviews with the innovation managers could be conserved in the framework.

Nevertheless, these factors are just an initial proposition. Some factors are also not completely defined for the campaigns, e.g. which type of voting should be used. It is important to realize, that successful CS campaigns have to be developed over time and improved incrementally. To design a good CS campaign involves many different factors and the fine-tuning for finding an optimum is a task that can only be performed with iterations. Which is also why at Bosch an initial pilot phase will be launched in mid of July 2014. During this phase the innovation managers should try to apply the guidelines described in this framework. After this, it is important to reflect the suggested results in the framework towards the actual events that happened and update the descriptions.

7. Validation of CS framework

This chapter aims to validate the results from the previous two research phases. First it should be checked if the innovation managers correctly understand the identified CS types and if they confirm the relevance for Bosch's innovation process. Secondly, it should be validated if the framework has fulfilled its purpose to describe these two CS types in an understandable way.

The validation will be done via expert interviews. As experts the innovation managers at the different BDs will be used again, which have already been contacted during the explorative phase.

7.1. Interview preparation

The first part of the interview will focus on the validation of the identified CS types for Bosch. To do this, the interviewees will be briefed with the results of the thesis, so they understand the two CS types and for which types of problems they are applicable. After this they will be asked to assign the CS type to a set of six historic CS campaigns that have already been finished at Bosch. They will have the choice to either chose one of the types, both or none. From the results it will be possible to see if the CS types are perceived as different or if some experts see a very large overlap between the types when they should be applied.

After this categorization task, the interviewee has to rate both CS types on a Likert scale (1=completely disagree, 7=completely agree) from 1-7 and argue their choice.

In the second part the framework will be used to describe how the CS type should be implemented in detail. After providing the interviewees the chapter about the framework from this thesis document, they have been again asked to fill out a questionnaire. The questions from the questionnaire have to be answered via a 1-7 Likert scale while the interviewer noted the interviewee's arguments and reasons for their choices down.

7.2. Results from interview

In the following the results form the interviewees are summarized in a table and the top findings are summarized.

Table 18: Validation part I, categorization of past campaigns

Part I: Categorization of past campaigns	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Campaign 1	I	I	I	I	I
Campaign 2	E	E	E	E	E
Campaign 3	E	E	E	E	E
Campaign 4	I/E	I	I	I/E	I/E
Campaign 5	I	I/E	I	I	I
Campaign 6	I	I	I	I	I

Most experts have similarly classified the historic campaigns within Bosch. Campaign 4 seems to be an in-between case and could be either considered expert sourcing or idea sourcing. The context of campaign 4 was related to finding new product solutions within a very high tech area, which provide reasons to chose both possible types. Nevertheless, as it is about creating new business solutions, it should be rather considered idea sourcing than expert sourcing, which is also the tendency when taking expert 2 and 3 into account. Overall, we see that the cases could be differentiated very clearly.

The historic campaigns have been taken from an expert community within Bosch and have not been filtered. Even though the amount of campaigns is too low to be generalized to the overall Bosch situation, it is still a good indicator that the identified CS types are suitable for Bosch.

Table 19: Validation part II, evaluation of identified use cases

Part II: Questions about identified use cases	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Introducing Idea sourcing enhances the innovation process at Bosch.	5	2	3	3	7
Introducing Expert sourcing enhances the innovation process at Bosch	6	5	6	7	4

Most experts preferred expert sourcing to idea sourcing. The main reason was that the effort of idea sourcing is not expected to satisfy the returns. Especially as the alternative of workshops or even multiple workshops are perceived as more efficient. These results also match the proposed results from the previous chapters. Expert 2, with the lowest rating on internal idea sourcing strongly argued, that employees at Bosch do not have

enough heterogeneity to provide valuable solutions or especially disruptive solutions. Expert 5 had a different opinion to this; he argued that idea sourcing is an essential part of boosting Bosch's innovation culture and that the diversity at Bosch is larger than in any other company, which will can make it successful. In his opinion expert sourcing should be established as a tool, but it should not be the priority as there are already alternatives available and the problem can be solved by different ways.

Overall, most experts confirmed that the use case of expert sourcing is very valuable for Bosch. The argumentation was mostly in line with the benefits mentioned in this thesis.

Table 20: Validation part II, evaluation of framework

Part III: Questions about framework	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
The framework can be easily understood	6	7	7	7	6
The framework highlights the differences between the two CS types	7	7	6	6	6
The introduced framework helps me to understand how to set up and run a CS campaign	5	4	5	6	6
The framework should be used as a best practice guide for setting up CS campaigns at Bosch.	6	5	5	7	5

At last the framework was introduced to the innovation managers with the example implementation of the two CS types. All experts agreed that the framework can be quickly understood as it was very reasonable for them using the three perspectives human, organizational and tooling / method. Also the experts could quickly understand the process steps, which is why they all agreed on the statement that the framework could be easily understood.

Also with respect to the second statement, which was asking if the framework can help to identify the differences between the challenges, was commonly approved by the experts.
The question if the framework helps the innovation managers to set-up and run CS campaigns was confirmed but some doubts have been issues. Expert 2 liked the simplistic structure, but criticized that many important details cannot be included. For example the user side of a CS system are handled in a too static way and it was not displayed how many different kind of personas are represented and how they exactly

interact. Also that the incentives are changing over time for the users, which is something that could not be displayed in the framework.

At last, most experts agreed that the framework should be used as a best practice guide that could be provided to the campaign mangers at Bosch to explain how to set up a campaign. Most experts advised to use a more comprehensive medium to transfer the framework information, for instance in form of a poster, infographic or booklet.

Overall the feedback from the experts was quite confirmative of the work that has been done. The reasons could be that the CS types as well as the framework are kept very general and simple, so it was easy for the experts to relate to that with their existing knowledge.

7.3. Reflection on external and internal validity

As this evaluation has been done within the Bosch context, the external validity is not given. This is something that could be evaluated in a future research projects.

From an internal validity point of view, we could see that most experts agreed with the proposed differentiation of the CS types. Nevertheless, the number of experts is too small to guarantee a validity of the results. Also the method of expert interviews for this validation purpose could contain some bias. As the experts have been involved in the development of the CS types they might feel bias to rate the understanding better than unrelated experts in this field.

To sum it up, the external and internal validity of this confirmation phase is low, even though the experts collectively approved research findings. Nevertheless, introducing this confirmative phase has had a valuable purpose, as it provided new inputs to improve the created framework and its implementation. If Bosch is planning to use the framework in the future, these inputs can be used to create an improved revision of it.

8. Conclusion and recommendation

The goal of this research thesis was to identify the CS types that are most relevant for tech-driven multinationals that are active in the B2B area. To answer this question, an explorative case study with a confirmative element to validate the results has been performed in cooperation with Bosch. By analyzing Bosch's pressing innovation problems together with the innovations that successfully reach the innovation pipeline, it was possible to identify the use case of 1) expert sourcing and 2) idea sourcing with crowd-voting as the most relevant use cases for Bosch.

To differentiate the CS types, several contextual factors have been identified. One factor is the knowledge distribution about the CS campaign, as this factor provides the understanding of how each CS campaign should be applied in different contexts. Furthermore, to protect company property from knowledge leakage, IP and confidentiality are factors that need to be taken into account. In such scenarios crowdsourcing is generally not an option, but expert sourcing is, as the crowd is more controllable (e.g. using NDA).

Additionally, a CS framework has been developed to describe the two CS types in their complete nature. The CS framework had the goal to conserve the knowledge collected during the exploration phase. Furthermore it helps to highlight the difference of the CS types, to further enhance the understanding how the nature of each type.
The CS framework was used to implement the identified CS types and make them relevant for the Bosch context at the end of the research. As the implementation of the framework contained information and recommendations that are very specific to the Bosch context, it shows a practical focus, which was yet considered helpful to generate the recommendations for Bosch.

8.1. Discussion

Within this research project there were three separate tasks. First, it was about identifying a set of use cases for potential CS applications that could be used within an employee crowd. The second task was about analyzing the innovation process and mapping the most relevant CS use cases into the innovation process. The last task was to codify the knowledge about the CS types and creating a best practice guide.

All three tasked turned out to be very extensive and it was hard to combine all relevant information in one thesis document. Therefore, a previous demarcation could have helped to focus on one of these aspects of the research. For instance, limiting the research to one CS type (e.g. idea sourcing) beforehand might have been more effective for drawing concrete conclusions.

Moreover, the first steps within this research project were rather scientific research whereas the later steps became very applied, e.g. building the framework and the best practice guide. This indicator should have been noticed and used to split the research project into two different research projects, one theoretical and one practical. The theoretical project could for instance focus on identifying the use cases, whereas the practical could focus on the service design for one specific CS type within Bosch.

8.2. Future research

The topic of this thesis was defined in-between two emerging fields for CS. One side is the aspect of enterprise CS in B2B firms; the other side is about internal CS in large multinationals.

In these two fields, it is likely that in the next year more publications will appear. In this thesis, there have been two major CS types identified, that are most relevant to the Bosch context. The next step would be to see if this result could be transferred to other firms in this industry sector or other industry sectors. The long-tail of knowledge theory to categorize the type of problem is a very general theory, so it is very likely that it can be transferred. A quantitative study about this theory could help to validate this hypothesis with a larger external validity.

Also the literature review section, which was creating the typology of different CS types and mapping the benefits and drawbacks of external and internal crowds, has not been done from an overview perspective. There have been papers that analyze some of the differences between external and internal crowds, but it was only limited to a small number of factors.

Another future research topic is about the developed framework in this thesis. The framework is build upon two adopted theories in CS and fits to the identified CS types in this context. Nevertheless, it would be interesting to see if the framework can be generalized to other enterprise CS types. By using the framework it might be possible to compare CS types from different companies or industries and analyze how the elements within the framework differ from each other.

8.3. Recommendations for Bosch

The two CS types 1) expert sourcing and 2) idea sourcing have been identified to be most relevant for improving Bosch's innovation process and should be implemented in the near future. Nevertheless, both CS types should be seen as an additional method to the existing innovation methods. For each CS type, there are alternatives available, which might be more efficient depending on each individual case. Especially for idea sourcing, high efforts are involved where the gains are highly uncertain. Idea sourcing should therefore only be used on special occasions for campaigns that are ideally related to involving the participants in the corporate strategy.

End of July 2014, the pilot phase of the CS system from the company Hype© will be launched at Bosch. The system is designed for idea sourcing and Bosch will receive a basic version of Hype's existing software with minor Bosch specific adaptations. As idea sourcing has been also confirmed in this thesis as a valuable CS type, Bosch should use the created best-practices for setting up and running their initial campaigns. Also as in the framework implementation chapter some needed features have already been identified; it could be used to define the requirements of the new system. When new insights are generated during this pilot, which are not explained in the framework yet, they could be incorporated in creating a new revision of the framework implementation.

Moreover, one key finding, which has also been later on validated by the innovation managers, was that expert sourcing can be more valuable to support Bosch's innovation process than ideas sourcing. Expert sourcing has different requirements to the software platform, especially the task of identifying experts within a crowd. These requirements are not met by the current pilot system. As a preliminary trial for expert sourcing, Bosch could use the CS system from Hype. There are already expert communities available and also the internal platform ask.bosch.com has users that used tagging to describe their field of expertise. These people have to be manually identified for before each campaign. With that a small set of potential experts can be invited, which can then be

asked to forward the invite to people they think are experts as well. Then it is possible for Bosch to collect experience for this CS type as well.

Both CS types should later on be realized in a single platform. There is still a big overlap on the tool requirements between expert sourcing and idea sourcing, so to avoid having two tools in place, which could confuse the employee's, it should be aimed to generate one software solution that allows both. For both CS types it is important to continuously monitor the results and try to improve it over time. CS has many variables that are deciding upon the success or failure of a CS campaign. Finding the optimum for this is a task that can only be solved by iterations.

In the longer run, an automatic system for expert sourcing should be established. The automatic expert identification plays an important role. Using data mining techniques to mine the content within the enterprise social media and other content within Bosch could be one promising way of solving this task. A explanation of such a system is described for external expert sourcing in Meige & Golden (2013) and can be adopted for internal purposes as well. The political situation with the workers council at Bosch could create some barriers; as such a system could be used for personal performance evaluation, which is not allowed by law. So this should be an essential part to be considered when such a system is created. Nevertheless, I would recommend Bosch at this time to look for another student or PhD candidate in computer or data science who could begin building a prototype for this system internally. As shown, also in this thesis, having a prototype available increase the possibility for later realization.

The last advice is directed towards the absorptive capacity of ideas. It is not directly related to CS but at the end influences the overall success. At the moment the only official way to bring an idea further is the stage-gate innovation process. For some ideas with a very young maturity level this can be a big barrier. Therefore, most ideas are developed within the teams while the lower management covers up for the risk. This unwritten principle works for most teams quite well, as they can provide the employees a protected space for this experimentation and also cover up for the time and costs of building a prototype. But not all teams within Bosch have these spaces for experimentation, especially countries with a higher power distance e.g. India and China. To tackle these issues, there should be a more simple seeding procedure than the innovation gates, which provides the innovator this protected space to work on their ideas.

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A. Appendix

A.1 Interview guide

As this interview guide was created in collaboration with Karan Shah, the following paragraphs marked green were the ones relevant for this thesis and written by me. The orange ones were mainly relevant for Karan's thesis, and the black paragraphs have been relevant for us both and therefore written in collaboration.

INTERVIEW GUIDE

For INNOVATION MANAGERS of different BOSCH BUs

→Prepare the cards already, would take too much time during the interview

(1) A brief introduction to Crowdsourcing and Open Innovation (internal & external) initiatives in Bosch and the purpose of our research.
- **→ Show two prototypes: Hype and C/UX ones**

(2) Ask them to describe a current innovation project they are working on or that is going on in their BU.
(3) Ask them to give other examples (4 would be good) which could then be used as a "baseline" to discuss the different aspects.
(4) We have to watch our time… 1/3rd of the time should be kept for Card Sorting.

1. Typology of Challenges (20 minutes)

What type of challenges would the IMs like to source the solutions for? How diverse is the range of these challenges across BUs?

1.1 Do you face particular kind of problems, challenges or innovation dilemmas for which you feel the need to seek help from external innovators outside your BU?

1.1.1 What kind of challenges are these?

1.1.2 Can you give us some examples? 3 would be good….

1.1.3 Why do you feel the need to seek external help for these dilemmas? How can they benefit from an outside perspective?

1.2 What is the nature of solutions or outcomes that you would like to receive for such problems?

1.2.1 How important is the fidelity/level-of-detail/maturity level of the outcomes that you receive?

1.2.2 Would you prefer to receive a particular level/fidelity (ideas, solutions, design, production drawings, engineering details) of solutions?

1.2.3 Is this preference generic or would it vary from challenge to challenge?

1.4 Would you prefer quantity of solutions over quality? Why or why not?

1.5 To what extent is your BU inclined towards disruptive/radical /out-of-the-box innovations?

1.5.1 Do you feel we can leverage external solution providers to do this better? Why?

1.5.2 Has your BU tried this before? (If yes) Tell us more.

1.6 Are there certain types of challenges that are specific to your BU?

1st Card Sorting Session (10 minutes)

1.7 Here are a few ways of classifying or categorizing challenges that we could find through some literature and contextual research. Can you arrange these 'types' of challenges in your order of preference/suitability for an OI platform by Bosch.

1.7.1 If you have in mind other 'types' of challenges not mentioned here, feel free to add them in these empty cards. (Provide empty cards).

1.7.2 Now create a cluster of cards (for eg. Highly technical + Incremental + low IP priority) to define 'Types' of challenges suitable for OI within Bosch (internal).

1.7.3 Now create a cluster of cards (for eg. Highly technical + Incremental + low IP priority) to define 'Types' of challenges suitable for OI outside of Bosch (external).

1.7.4 If there are more than 3 clusters, make them arrange these clusters in order of their suitability for an OI platform by Bosch (first internal, then external)

1.8 How do you deal with these challenges that you defined as suitable for open innovation nowadays?

2. Attitude towards internal (Bosch employees) crowdsourcing (15 minutes)

What is their attitude and what are their inhibitions/ concerns/worries towards approaching crowds within Bosch.

Getting only incremental ideas / "too Bosch typical" ideas

2.1 Do you think Bosch is big and diverse enough to run successful crowdsourcing campaigns internally? Why and why not?

2.2 Do you think having context specific knowledge helps or is even required to solve certain kinds of problems that demand an internal crowd? For what type of challenges do you think this is relevant?

Secrecy / IP

2.4 How pressing are problems with secrecy and IP when doing internal crowd sourcing over several BUs, over GBs?.

Culture

➔ *Define: collaborative idea generation*

2.5 Is the company culture within your BU ready for collaborative idea generation?

2.6 Which aspects of Bosch's organizational culture do you think are enhancing (or blocking) internal open innovation?

2.7 There are already many blocking issues when it comes to Boschs innovation culture, what is the most important blocker and how could it be improved?

2.7.1 Is silo behavior a pressing issue at Bosch? How can it be resolved? Activities that show success?

2.7.2 Because of the hierarchical structure of BUs, do you think there is often a case where local optimization of a single BU leads to knowledge hoarding and silo activities. Is this true? Is some change against this happening?

2.7.3 Do you know about the NIH syndrome. Do you think solving a problem in your BU involves first looking for external solutions or is NIH an issue? Is a "Proudly found elsewhere" attitude developing? If not, which measures would you suggest to develop such an attitude?

3. Attitude towards external crowd (15 minutes)

What is their attitude and what are their inhibitions/ concerns/worries towards approaching crowds outside Bosch.

3.1The main benefit of OI with an external crowd is the heterogeneity and diversity that can be accessed with OI outside the organization. Do you feel innovation in your BU can benefit from a more heterogeneous crowd? In what ways?

3.2 Do you face particular kind of problems or Innovation dilemmas which you feel can benefit from solution providers outside of Bosch?

3.2.1 Why? Can you give us some examples from your experience?

3.3 There are two main aspects to crowdsourcing innovation. Sourcing valuable ideas/innovation and sourcing the crowd's vote, opinions and evaluation. Does the second aspect, 'crowd evaluation' offer substantial benefits to innovation management in your BU?

3.3.1 In what ways can innovation in your BU benefit from the 'Wisdom of the crowds' phenomenon?

3.4 Secrecy is a pressing issue at Bosch, as many things are seen as confidential by default. Especially innovation related activities. Do you know ways how these issues can be bypassed? *What should change in the long-run?*

3.5 Have you ever used an external crowdsourcing platform before?

3.1.1 How were the results and how was your experience?

3.1.2 How do you feel about sourcing innovation from crowds outside of Bosch?

4. The Right Target Groups (5 minutes)

What are the potential (Internal & External) target groups?

4.1 Considering issues of confidentiality and IP, what target groups outside Bosch would you consider 'safe' for crowdsourcing innovation?

2nd Card Sorting Session (15 minutes)

4.2 Here are a few potential target groups (external and internal) that we could identify through literature and contextual research. If you have in mind other 'Target Groups' not mentioned here, feel free to add them in these empty cards. (Provide empty cards).

4.3 Can you arrange them in your order of preference or appropriateness for an OI platform by Bosch.

4.4 Can you relate the preferred set of Target Groups to the preferred 'Typology of Challenges' that we created earlier?

→ Match with the examples they have come up with…

4.5 As you can see, there are several dimensions along which potential Target Groups can be classified. Which dimension (or dimensions) for classifying Target Groups for an OI platform by Bosch do you like the most?

5. Evaluation & Selection (10 minutes)

How Democratic? To what extent does crowd-opinion govern idea selection?

Wisdom of the crowd / Democracy and Decision power of the crowd

5.1 To what extent does the crowd's opinion (likes/votes/pre-orders etc) matter?

→ Relate to the provided examples…

5.1.1 Would you like to use crowd intelligence or the 'wisdom of the crowds' to select the best solutions?

5.1.2 How Democratic would you like the idea selection process to be? To what extent must crowd-opinion govern idea selection?

Defining the evaluation criteria

5.2 How would you like the means or criteria of evaluating the ideas/solutions to be?

5.3 From the top of your mind, can you give us some examples of evaluation criteria that you consider important? → Recall from Mr. Diez Workshop…

5.4 Within your BU, you have several evaluation IGx criteria that an innovation needs to pass to get implemented. Do you think these criteria can be adopted to evaluate crowdsourced ideas too?

5.5 Are you fine with making the evaluation criteria fully transparent to the participants? Why or why not?

6. Final Question, selection and follow up (absorptive capacity)

→ Maybe keep it optional if we run out of time

6.1 Every idea needs to be processed via the normal way…Pre-study, concept-study? Exceptions?

6.2 What happens if the idea does not fit to your BU? Is a transfer to another BU possible?

6.3 Do you consider using the Bosch Startup-Platform (BOSP)?

6.4 Do you consider outsourcing the idea to someone else? e.g. Supplier, competitor, joint venture (inside-out part of open innovation)

6.5 In which of the following crowd applications do you see the most potential for your BU.

3rd Card sorting (5 min)

A.2 Survey to categorize ideas

Idea# (or title if the idea is not confidential)										
Classification of Idea	Name	Answer possibilities								
	Innovation Gate	*Innovation Gate*	IG 2	IG 3	Already handed over to series production (survived IG3 dying)	Others				
	Type of Idea	*Type of Idea*	organization / CiP	business model	market	product	service	technology	process engineering methods and tools	
	Type of innovation	*Type of innovation*	Evolution (Market+Tech exist)	Tech Leap (Tech new, market exist)	Expansion (Market new, Tech exist)	Revolution (Market+Tech new)				
	Target-Customer	*Target-Customer*	Internally	Customer (B2B)	End-Customer (B2C)					
	Maturity level	*Maturity level*	abstract concept	detailed concept	Proof of concept	Prototype available	Production planning ready			
Evaluation criteria of Idea (from quick-check)	Market novelty	*Market novelty*	well served market within GB	well known market served at Bosch, but not in GB	well known market served by competitor, but not by Bosch	well know market served by other industries	completely new market (worldwide)	not applicable		
	Novelty / technical attractiveness	*Novelty / technical attractiveness*	well known and already applied within GB	well known technology applied at Bosch, but not in GB	well known technology applied at competitor, but not in Bosch	well know technology from other industries	completely new technology for Bosch and competitors	not applicable		
	Strategic Fit	*Strategic Fit*	no strategy-fit (NO)	complement / extents strategy	complete strategy-fit (YES)					
	Impact Potential of Idea	*Impact Potential of Idea*	no impact on products	impact on single product	impact on product class (EZKL)	impact on multiple product classes (EZKL)	impact on all products			
	Market attractiveness	*Market attractiveness*	### gut feeling is also ok here :) ###	not important for this idea	high	medium	low			
	Customer benefit potential	*Customer benefit potential*	### gut feeling is also ok here :) ###	not important for this idea	high	medium	low			
	Realization effort	*Realization effort*	### gut feeling is also ok here :) ###	not important for this idea	high	medium	low			
Background information about idea	Efforts to create a proof of concept / prototype	*Efforts to create a proof of concept / prototype*	Less than 10.000 €	Less than 50.000 €	Less than 250.000 €	Less than 1.000.000 €	Greater than 1.000.000 €	not applicable		
	Biggest Challenge	*Biggest Challenge*	Market size / customer demand	Tech, Feasibility unclear	Find resources within company to realize the idea, the suitable GB might not have time to pursue the idea	Find someone within company that is willing to carry the risk if the idea failes				
	Intelectual property	*Intelectual property*	not important for this idea	patent not possible for the idea	patent applied (or will be applied soon)	patent acquired	Licencing existing patent			
	Confidentiality	*Confidentiality*	Very confidential (max 20 people know about it)	Confidential (> 20 < 200 people know about it)	Internal (within Bosch can be known)	Public (everyone can know)				
	Source of innovation	*Source of innovation*	Single developer within GB came up with it (Bottom-up)	Team within GB came up with the idea (Bottom-up)	Developed during workshop with inno managers	CR recommended to work on it	Outside trigger (Customer, university, supplier, competitor, ...) -> please write in line below	Introduced via "Erfindungsmeldung"	other -> please write in line below then	
	"Champion" behind the idea	*"Champion" behind the idea*	Top management Bosch	Top management Division	Middle management	Lower management (Group leader)	Technical expert behind this idea or someone that pushes many ideas	other -> please write in line below then		
Last ones...	When dou you personally think the idea will be realized	*When dou you personally think the idea will be realized*	1-6 Month	less than 1 year	less than 2 years	less than 5 years	more than 5 years			
	Who is the most important stakeholder to leverage this idea and make it a success?	*Who is the most important stakeholder to leverage this idea and make it a success?*	Governmental / Legal de	Bosch top management	Division management	Product-class	Department level			
	Do you think the idea will be realized at all? (Just your gut feeling)	*Do you think the idea will be realized at all? (Just your gut feeling)*	Yes (100%)	Probably (70%)	Maybe (40%)	Probably Not (10%)				

A.3 Complete best practice guide for Bosch, covering idea sourcing and expert sourcing

Phase 1: Define

Define Target Group	**Idea sourcing:** In this case a large heterogeneous crowd should be addressed (> 100). As the nature of this challenge should have many potential answer possibilities, different perspectives will improve the solving process. Therefore it would be good to invite a wider range of divisions and people from different functions and locations. If a BD has internal customers, which is the case for internal services but also for some B2B components, they form a valuable target group and should be included. **Expert sourcing:** In this case, the target group should consist out of a small group of specialists (10 - 100) that have a minimum of knowledge for being able to provide input to the CS challenge. Nevertheless, also experts from related fields should also be addressed. It is often the case that technical problems have many causes. For instance when a control system is not working, the problem could be related to the sensors, the signal processing, control parameters, actuators etc. The biggest challenge here is to identify these experts, as they are often spread all over the company. Some approaches let the users fill in some fields and tags of their expertise, which could be evaluated by the tool. Some more advanced approached use data mining and prediction techniques and analyze the employee's content submitted in the enterprise social media or other channels to identify their expertise.
Sponsor / Problem owner	**General:** For CS it is important to have someone available, that is willing to realize the produced outcome of a CS campaign. This person is often referred as a Sponsor. Without having this person in place, the CS campaign's produced outcome will have less chance of realization, which in turn will reduce the future motivation of the participants. **+ Expert sourcing:** For expert sourcing there can be two roles, one sponsor that is willing to provide resources to realize the solutions and one problem owner, which is responsible for the problem. From the analysis it often turned out that technical innovations are often triggered bottom-up. Having a technical expert that is not too high in the hierarchy as problem owner improves the communication between the participants. Instead of asking

questions to the sponsor, they can directly address one of their peers.

IP Strategy

General: The IP strategy needs to be defined before a CS campaign. Some companies prefer to own the generated IP of the campaigns completely, but this can form a strong demotivator for the participants and is only possible if there are other strong incentives, which is mostly money. For Bosch the IP strategy should be similar to the existing strategy with their patent applications. Which is at the moment that the inventor is entitled to receive the patent. Yet, Bosch will receive the rights to make use of the patent.

In addition to that, the IP rules for the participants need to be laid out clearly. Often the first one who submits a patentable idea will be entitled for the patent. If other participants deliver valuable contributions they can also be part of the patent ownership. But this needs to be clarified case by case. This satiation will become clear when the patent is about to be filed, and it needs to be described which parts are truly innovative. Nevertheless, the CS tool needs to document a history of all actions with their time-stamps to reconstruct the situation.

+ Expert sourcing: In this case the chance for patentable solutions is high. It can make sense to inform a colleague with patent expertise before launching the campaign.

Description of challenge

General: The description of a CS challenge is one of the, if not the most curial part of a CS campaign. It is the first entry points for participants and they will make their decision if they want to participate or not. Therefore, the description needs to be appealing to the target group and raise the motivations to participate. Furthermore, the description needs to describe the problem in the right way while not biasing the solution space of the participants. The description should on the one hand be as open as possible and at the same time as precise as necessary. Finding the balance between these dimensions will yield the most efficient results. A good guide for creating a good description can be taken from (Sloane 2011).

+ Idea sourcing: When addressing a larger crowd, the mission and vision behind this campaign needs to be emphasized. Social and ethical motives increase he motivation to participate significantly.

+ Expert sourcing: For expert sourcing the description should explain some deeper explanation about the problem and the scientific background to that problem. For technical experts, learning is a huge motivator, and an attachment of easy study material like videos can be an inspiration for them to participate.

Timeframe for challenge

Idea sourcing: For idea sourcing the timing of the challenge plays an important role, as a large crowd is addressed and the chances should be good for them to be available. Common mistakes are launching the CS campaigns on Mondays or Fridays or even worse on Holidays or vacation periods. A good length for idea sourcing campaigns is around 1-3 weeks, depending on the expected quality of submitted ideas.

Expert sourcing: For expert sourcing the timing is not as crucial as for idea sourcing, as the participants will be invited directly. Nevertheless, also here vacation periods should be avoided. The duration of expert sourcing campaigns can be slightly longer, as some participants like to do some private research before submitting their ideas. Therefore a frame of about 2-4 weeks would be suitable.

Expected outcome

Idea sourcing: For each challenge the expected outcome together with the evaluation criteria should be clearly specified in the description of the challenge. If the submitted ideas should fulfill certain criteria that need to be explained the tool could provide a template or multiple input fields, which directs the users think in several directions before submitting an idea. Overall, the required efforts should be held small, but not too small. The participant should require about 0.5 – 5 h to work out an idea ready for submission. Even though this might discourage participants with quick five-minute idea sketches, it will increase the overall quality of submitted ideas. Expecting too much work from the crowd is also not possible, as the employees also have to fulfill their day-to-day business responsibility.

In case there is a plan to start a larger CS campaign, e.g. writing a business plan in form of a competition, the competition should be held outside the normal working time. The crowd should then also contain external participants to make this point more clear.

Expert sourcing: In expert sourcing the expected outcome should be a concept that is able to solve the initial problem. The submitted solutions should consist of two parts, the concept and a realization plan of how to create a proof of concept or a prototype. Also here the amount of work should not require too much of the employees working time as they are responsible for their day-to-day business activities; 0.5 – 10 h a realistic amount of time the participants could invest. The implementation of the concept should happen after the CS activity.

Phase 2: Initiate and promote

Invitation	**Idea sourcing:** In this case the invitation takes the form of an open call. The dimension described by Phillips (2010) should be participative instead of invitational. Meaning that a large group of people are addressed via a broadcast and are asked to participate. **Expert sourcing:** For this case, the invitations are directed only to a set of pre-qualified users. The invitation can be more personal and should address the fact that they have been specially identified and nominated to participate, as this can be a motivational booster for them. A good practice is to allow and encourage the participants to invite additional colleagues that are in their opinion feasible to solve this problem. This can improve the number of participants, as there are often experts that are not active on the virtual collaboration channels and can not be identified as an expert with such a system.
Kick-off	**General:** For each crowdsourcing campaign there should be a kick-off event. It will show the participants that the CS campaign is an important event and their attributions are valued. **+ Ideas sourcing**: In this case the key objective of the kick-off is to raise motivation for the participants. Emphasizing the value and mission behind the campaign and the possibility to have employees contribute to the corporate strategy can increase their motivation. Also if there have been success stories of previous campaigns, this can be used as a motivator. **+ Expert sourcing:** The main objective in expert sourcing is to clarify the problem in more details and also show the context of the problem in different facets. This can help to stimulate the participant's way thinking, but it needs to be taken care that it won't get biased into a single direction. Another objective for expert sourcing is to create a more personal atmosphere between participants. Also the problem owner should introduce himself personally and become a central contact person for all participants if they have questions or doubts.
Top management support	**General:** For all CS campaigns the top management of a company should provide a personal statement of the importance for these campaigns. This statement should relate to the company's innovation culture address the strengths and also their weaknesses. For the Bosch case, one weakness could be a high general risk aversion. In this case the top management should address the importance of innovations and the fact that risks need to

be taken to be innovative.

Also the issues about using their normal working time for the CS campaigns should be addressed. The top management should emphasize that each employee has right and even the duty to be part of such innovation campaigns if they have something to contribute. Also the 5% rule at Bosch has not reached a high awareness level and should be emphasized.

Advocates

General: To raise the awareness and importance of the CS campaigns, there should be some people that are willing to spread the word within the company and encourage people to participate or provide help in the development of new CS activities. These so called advocates are often identified quite quickly, but they need to be made aware of their role to spread the word (Hrudicka et al. 2011).

Promotion channels

Idea sourcing: As the invitations in idea sourcing are send out via a broad cast, multiple promotion channels can increase the reach. The company newspaper or the starting page of the intranet could be a suitable channel. Also printout media as posters that the secretary can print out and put into the coffee corners or other public places can be a very efficient promotion channel. At last, e-mails or social media notifications should be send as well, as people use them often as references to look-up information. Nevertheless, only emails are often not enough, as this information channel contains information with high priorities where broadcast e-mails can easily get ignored.

Expert sourcing: As the group of participants is directly addressed, e-mails or any other form of private messaging are a suitable.

Phase 3: Run

Way of collaboration

Idea sourcing: For idea sourcing the CS system should allow the following three aspects: voting, solving and co-creation. The participant's idea should be public to be reviewed by others. Participants that are not having an own idea are then able to comment and enhance other people's ideas. The voting part will be discussed in the next process step.

Expert sourcing: In this case the focus should be on rating, solving and co-creation. The rating part will be discussed in the next process step. Also here the experts should review each other's ideas with comments and try to improve them. For this type of CS, it should also be possible to submit ideas directly for review without having it for public review. In cases the submitted idea contains already patentable content or if some information is very

	confidential these so-called “silent” submissions can provide a solution. The moderator of the platform should check if the content really needs to stay hidden, as it should be aim to have most ideas open. Currently, the Bosch innovation culture is not ready for pure openness, but using a moderator to convince the participant to discuss it openly by raising the awareness of open innovation can be a good control point to stimulate a cultural change.
Motivation to participate	**General:** A good CS system consists out of a well-balanced combination of cause, achievement, social and efficacy elements. In the literature review of this thesis, an explanation of these elements is listed. In the following only the strongest motivators are listed to show the differences in the two CS types. **+ Idea sourcing:** For this case the extrinsic cause related motivation is very strong. The possibility to create value with their idea and impact the corporate strategy motivates many people to participate in such activities. The strongest motivator that has been identified in a former thesis at Bosch is the possibility for the participants to be part of the realization of their idea. **+ Expert sourcing:** In this case the intrinsic motivators should be tackled. On the one hand the participants should be motivated by efficacy and learning something new to participate in a challenge. Furthermore, the possibility to get to know more experts in this field and increase their social network should be a motivator for people to participate in this CS type.
Incentives	**General**: Explicit monetary incentives should be avoided for internal CS because it can create conflicts. As the participation of the employees is aimed to be part of the normal working time, these CS should not promote people to only participate in these environments to boost their salary. Also the collaboration between employees could be reduced by monetary rewards., One very effective incentive with little effort is the recognition of the contributions from the management. At last having organizational structures in place to let people later work on their ideas can incentivize their willingness to participate significantly. **+ Idea sourcing**: To show the recognition of the users, it can be very helpful if the sponsor, usually someone from the upper management, is providing his feedback on the submitted ideas. **+ Expert sourcing**: In this case also the potential of receiving a patent for their idea can be an incentive for inventors. Bosch can provide the resources needed to file a patent in the inventor’s name.
Seeding	**General:** Being the first one to publish an idea on an open platform with many anonymous users can be a small psychological barrier for someone. To

overcome this initial barrier it is beneficial to seed a CS campaign with some initial ideas. People besides the sponsor or problem owner should ideally submit these ideas, as this will increase the user's perceived group feeling. If these initial idea submitters, often called seeders, are not available, having "ghost writers" can be a viable option.

Moderation

General: Similar to other online social platforms, moderation is an important part to control and motivate the users. For both CS types one aspect of moderation is to consolidate redundant content and ideas. Another aspect is to control and even remove inappropriate content.

+ Expert sourcing: As mentioned in the context chapter of this thesis, the German law does not allow exchanging IP related to defense products. The problem is that also dual-use goods are included in this law. Therefore, if some ideas are starting to discuss technology solutions that fall into this category, the moderator needs to ensure that this idea will not be made available for foreigners. This issues is also present for idea sourcing, but the likelihood for the submitted ideas to be IP relevant are lower.

Ease of use

General: As the CS campaigns are addressing people via an open call; their participation depends on each individual's motivation. Therefore, the virtual collaboration platform needs to be appealing and provide a high ease of use. During the interview one stated that the amount of tools at the Bosch are too high, hence the willingness to learn a new tool is low. Therefore, the workflows of the CS system need to be implicitly embedded in the platform, so that new users can easily understand what they have to do without having to read any manual.

Phase 4: Evaluate and select

Crowd voting and rating

Idea sourcing: Crowd voting can be used to pre-filter the amount of ideas that have to be taken for review to reduce the effort of the reviewers. But there are risks that crowd voting results are biased. For instance colleagues from the same division or region can vote up their colleagues ideas for sympathy reasons. Also crowd voting tends to favor incremental solutions that are easy to understand by most people. This point can be resolved by introducing a multi-dimensional voting. Having multiple dimensions, the participants can vote an submitted idea for instance by its innovativeness or creativity; if that is an important factor the campaign initiator wants to achieve. With that system in place, radical or creative ideas have a higher chance to survive. The dimensions should be held very small, otherwise it can make the voting

	procedure more complex. The final selection of crowd-winner will then happen for each dimension. For instance the crowd can identify the “most creative idea” and the most “cost saving idea”. At last often those ideas with an already high rating will receive most future ratings, as they are more often viewed and the bandwagon effect and groupthink becomes an issue. This problem can be tackled by having the votes ratings hidden until the end of the campaigns, so people do not know, which ideas are the potential winners. **Expert sourcing**: As the amount of ideas will most likely be smaller for expert sourcing campaigns, a pre-filter via voting is not necessary. Here rating instead of voting should be used. The difference between rating and voting is that the participants have a greater magnitude, e.g. 1-5 stars, where in voting they only have one vote, e.g. up or down. Also voting creates an order, whereas rating can be more seen as an opinion. A multi-dimensional rating can help to get some inputs from the experts, which can later on help the final reviewers to make better decisions when selecting the ideas that will be taken further. Also giving the experts the ability to rate submitted ideas is a sign of their recognition, which can help to boost their motivation. The dimensions for the rating can be higher than for idea sourcing, but they should not make the rating procedure too complex. Also here, to reduce groupthink, the ratings should be hidden, until the expert has submitted his own rating.
Evaluation and selection	**General**: The final evaluation should be taken care by the campaign initiators, as they are the ones taking over the ideas for realization and therefore should select the ideas with the greatest chance of realization. The evaluation criteria should be the same as at the beginning communicate to the crowd in the campaign description. The inputs from the crowd voting or ratings can help to evaluate ideas, but the initiators should do the final selection. **+ Idea sourcing:** For idea sourcing the participants voting and rating should be acknowledged. Even if the top rated idea is not likely to be realized, the most popular ideas from the crowd should be taken forward in some way. Even if at the end it is only created an online community where people can voluntarily continue developing concept.
Feedback	**General:** Each contribution needs to receive an individual and personal feedback as a form of acknowledgement. This will create some effort for the reviewers but it is a necessity to keep future CS campaigns alive. **+ Idea sourcing**: In this case only the top ideas or ideas that reach a certain vote count need to receive individual feedback, but only if at the beginning of

the campaign it is clearly stated that the evaluation will be done like this. The not selected ideas should still receive some kind of message that appreciates their input.

Phase 5: Close

End of campaign	**General:** Similar to starting the CS campaign with a kick-off, there should be an event to end a campaign. The key objective of this event is again to acknowledge the efforts of the participants. Furthermore the sponsor of the campaign should present the results and the ideas that will be taken forward. When planning this event, the participants submitting the winning ideas should be made available for this event. **+ Idea sourcing:** Depending on the size of the participants and about the amount of successful ideas, a larger event where people meet in person can be held. Also small non-monetary prices can be given to the winners.
Handover	**General:** For most selected ideas, they will be handed over to the innovation management of the company. At Bosch this is a stage-gate approach. For most ideas it will probably not be possible to extract the idea submitter from its existing position and make him the project manager of the innovation project. But at least it should be tried to find a way of incorporating him in some way. Especially, when it comes to building the actual proof of concept or prototype, the inventors should be somehow considered in the planning phase. To enable such a flexible transfer, the company needs to provide some ways to split and shift a person's responsibility within the company. **+ Expert sourcing**: In this case the likelihood that the idea submitter has the required knowledge of building a prototype is very high.
Documentation	**General:** The data about the CS campaigns, the submitted ideas and the participants need to be documented and conserved. It is an essential part of the knowledge management of a company. One application for this data is to identify redundant ideas or even campaigns. If one is planning to register a new campaign or a new idea, the system should try to compare the textual description of the new item with the historic items and provide a warning and a link to the historic item. For instance when a participant is about to submit an idea he will have the chance to re-think if his idea is actually something different or not. Another reason having this database is to recall the experts or people that have been interested to work on specialized topics.