The Intermediation Functions Connected to the Phases of a New Product Development Process

An Investigation of a Public and a Private Intermediary in a Micro Perspective

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Abstract

The process of innovation remains challenging for companies in general and for small firms in particular. Limited resources constitute an obstacle on the small firm’s path towards market launch and the need for supportive measures is evident. Today, as the technology is developing at an exponential speed, the time-to-market shortens, underlining that the innovation challenge of small firms is an urgent matter. Given the limited resources of the small firms, this thesis defines the access to external competence as well as an established new product development process as crucial factors for successful innovation. Providing these necessary functions, a public intermediary, originating from policies, is considered a viable solution. The contribution of this thesis lies in investigating whether or not a private intermediary, not supported by policies, can provide the same functions as a public intermediary. In addition, the thesis expands the knowledge about the intermediary functions present in the innovation process by relating them to specific phases in a generalized new product development process.

The results in this thesis are qualitative, based on a profound literary study as well as a comparative case study, examining two diverse kinds of intermediaries in a micro perspective. The first case is a public intermediary, operating with a strong business focus, as its mission is to economically strengthen the Swedish industry. The second case presents a technology based consultancy firm, acting as a private intermediary and centered on questions related to R&D. Applying Howells’ (2006) intermediation functions to the two diverse cases, a comparative study of their offered functions has been performed.

The micro perspective study has proved the acknowledged intermediation functions to be applicable to specific phases in a generalized new product development process. As several functions appear in multiple phases of the new product development process, the generalized process is observed to be iterative. This notion questions previous definitions of the intermediation functions during an innovation process, as the processes have been simplified as linear in prior research.

Using the generalized new product development process as framework for a comparative analysis, it has been concluded that the private intermediary can provide the same functions as the public intermediary. In extension, the private intermediary is able to offer additional services, not legally permitted for the public intermediary, such as selecting external actors and negotiating agreements. As the private intermediary can provide an extended assortment of functions, while not being dependent on government funding, the question of whether or not the public intermediary still fills a necessary function has been raised. However, additional values, such as objectivity and a non-profit-interest have been linked to the public intermediary. As these attributes are valuable to the small firm, further studies on the support not incorporated in the investigated functions are needed.
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1 Introduction

The days when a single firm could keep up with the market needs are gone (Slowinski et al., 2009; Tether, 2002). Due to the exponential growth of technology, the time-to-market has to be shortened in order to secure a market position and make a profit before the innovation itself becomes obsolete (Ritter and Gemünden, 2003). To remain competitive in the race to the market, efficient innovation is crucial. Although innovation is a common word in today’s society, the management of innovation is still an abstract issue, creating difficulties for companies of all sizes. (Trott, 2012)

While small firms usually are capable of generating innovative solutions, it is well known that they also suffer from resource constraints (Wernerfelt, 2005). To some extent this is a generic problem, and hence it is easy to jump to conclusions, simply assuming a strict correlation to financial resources (Wiklund and Shepherd, 2005). However, when engaging in innovation, financial resources are not the only limitation. From a knowledge perspective, the innovation process is complex and multifaceted, resulting in an increasingly hard struggle for single firms trying to innovate on their own. In order to expand their internal knowledge, companies are to a great extent starting to search among external partners, aspiring to create collaborative arrangements for innovation (Tether, 2002). Hence, the access to a network of external actors can be equally important as financial means to the small firm.

Due to the transition towards an open innovation paradigm, implying a change from strictly in-house R&D to a corporate environment where the company boundaries are blurred out, the knowledge sharing between firms is growing and increases the openness in the business environment (Chesbrough, 2003; Chesbrough et al., 2006). However, to the small firm, the selection of external actors can be rather limited, as it is challenging for a small firm to attract suitable partners. Consequently, small firms are particularly urged to develop an absorptive capacity to attract external resources (Spithoven et al., 2010). Another factor, proved crucial for a successful path to market, is an efficiently structured new product development process (Trott, 2012). Also in this instance, the small firm is challenged by limited resources. The financial means needed to establish an internal R&D department are often lacking, reducing the possibility to create and implement a suitable new product development process.

Acknowledging the small firms’ innovation challenge described above, politicians frequently initiate policies aiming to stimulate innovation in small firms (Edwards et al., 2005). A tool for putting these policies to practice is the implementation of public intermediaries, aiming to support the small firms throughout the new product development process (Lee et al., 2010). Intermediaries originating from policies have become common and important supporters to enable and speed up the innovation process of small firms. In particular, they provide small firms with a structured and applicable new product development process that relies on a network database with wide applicability (Lee et al, 2010). In addition, the role of the intermediary is expanding, from acting solely as a broker, to gaining a holistic perspective of the new product development process. Supporting and directing the new product development
process of the small and often inexperienced firms, the intermediary can significantly affect the course of the projects. (Howells, 2006)

In the era of open innovation, the increased need for customized networks, involving a wide range of actors, positions the intermediary as a key partner for small firms (Alexander and Martin, 2013). In addition, the complexity of a more open industry climate, combined with the shortening time-to-market and the focus on innovation, stimulate the emergence of new types of intermediaries. Private companies, such as consultancy firms, are to a greater extent engaging in intermediating functions as they aim to help their customers during the path to market launch (Bessant and Rush, 1995). However, whether the functions of the private intermediaries are comparable to those of the public intermediaries remains an unexplored subject. As the role of the intermediary strengthens its position in the industry, the mapping of its function during the phases of a new product development process becomes urgent.

1.1 Research Question

In previous research, the intermediation functions have been linked to a vaguely described linear innovation process. As the innovation process does not include defined stages, it has not been possible to connect the intermediation functions to any specific phases in a new product development process. The lack of a defined new product development process, applicable to different intermediaries, inhibits a comparison of the functions provided by different types of intermediaries in specific phases of the process. Hence, the objective of this thesis is to link the intermediation functions of two contrasting intermediaries to the different phases of a generalized new product development process. With the purpose of comparing the functions of a public intermediary and a private intermediary in a micro perspective, the following research question has been formulated:

*How do the intermediation functions provided by a private intermediary, in the specific phases of a new product development process, differ from those provided by a public intermediary?*

1.2 Delimitations

The thesis will focus on the roles of the intermediary, acting as the link between small firms and external actors. In order to make the research more specific, a number of delimitations have been set to enclose the study. Primarily, the thesis will address the geographical region of Sweden. Furthermore, the research will solely investigate the role of the intermediary when aiding small firms, defined by European standards as a firm with less than 50 employees. In this thesis, the small firms serve as an illustration of how companies can benefit from the intermediation functions in the phases of a new product development process. Lastly, the thesis will take the perspective of the intermediary, aiming to compare the functions of a public and a private intermediary.
2 Theoretical Framework

In this chapter, a summary of the theory connected to the research question is presented. First, the intermediary approach is introduced, followed by a section on the new product development process. At the end of the chapter, a synthesis of the theoretical framework is presented, highlighting the thesis’ view on the content.

2.1 The Intermediary Approach

While large companies usually have the capacity to start a search process for suitable external actors, small firms are challenged by a lack of resources. Supplementing the limited internal resources of the small firm, an intermediary approach can be a solution. (Lee et al., 2010) According to Howells (2006), an intermediary can be described using a wide range of terms, such as ‘third parties’, ‘intermediary firms’, ‘bridgers’, ‘brokers’, ‘information intermediaries’ and ‘superstructure organizations’. In addition, various kinds of organizations can act as an intermediary, e.g. agencies (Howells, 2006), consultants (Bessant and Rush, 1995), regional institutions (McEvily and Zaheer, 1999), public organizations (Bakici et al., 2013) and incubators (Clausen and Rasmussen, 2011). Howells (2006) describes the versatile role of the intermediary as an actor that functions as an agent or broker, between two or more parties, during one or several stages of the new product development process. Here, it is important to note that the intermediary often acts within other areas of proficiency, having the intermediating function as a complement to its core business. Consequently, it is difficult to classify a company solely as an intermediary, which is also confirmed by Howells (2006). This thesis takes the internal competence of the intermediary in consideration, separating the functions provided internally from those provided externally, resulting in a more complete illustration of the intermediating activity.

2.1.1 The Intermediary as a Link to External Actors

The view of the intermediary has expanded to include more than simply connecting two parties; the intermediary might just as well be responsible for the mediation between a company and a network of actors. In addition to forming vertical relationships, the intermediary can also work horizontally, linking actors in a flat structured network. The relationships are often long-term, lasting through multiple innovation projects and providing a holistic approach for the clients. (Howells, 2006)

Howells (2006) uses the following three terms to define how the intermediary operates, depending on different collaboration constellations:

1. Operating ‘one-to-one’ refers to collaboration between the small firm and the intermediary, implying that only internal resources are involved in the collaboration.
2. Operating ‘one-to-one-to-one’ refers to collaboration between the small firm, the intermediary and an external actor contacted by the intermediary.
3. Operating ‘one-to-one-to-many’ refers to collaboration between the small firm, the intermediary and several external actors contacted by the intermediary.
Studying Howells’ (2006) three terms, it is evident that their main differences are connected to whether they are provided directly by the intermediary’s internal resources or by the intermediary’s database of external actors. Hence, these terms will be simplified in this thesis, describing functions provided either ‘one-to-one-to-many’ or ‘one-to-one-to-one’ as external, while functions provided ‘one-to-one’ are noted as internal. As the ability of managing multiple relationships becomes increasingly important for the intermediary (Howells, 2006), this Master Thesis positions the intermediary between the small firm and a database of external actors. Consequently, it lies in the role of the intermediary to keep an updated database of external actors as well as being able to mobilize the actors in suitable collaborative networks, complementing the small firm’s lack of resources. This approach is selected since the provision of external actors is regarded as a crucial component of the intermediary’s role.

When mobilizing the collaborative network, the composition of actors should be carefully considered (Lee et al., 2010). Two main variables should be taken into account when selecting the partners: the search breadth, i.e. the number of external actors, and the search depth, i.e. to which extent each external source is used (Laursen and Salter, 2006). Lee et al. (2010) emphasize the risk of involving too many actors, since this could have a negative effect on the level of innovation. The goal is to find a constellation that adds up to more than just the sum of its parts (Van de Ven, 1986; Trott, 2012). Regarding whether or not the partners in the collaborative network should alternate during the course of the new product development process, conflicting opinions are presented. According to Wallin and von Krogh (2010), a wide range of actors should be involved from the start of the process, even though the project might be more dependent on them during some phases than others. On the contrary, Davis and Eisenhardt (2011) claim that there is no need for the actors to be involved from the start of the project, as long as they can be efficiently mobilized in the phase in which they can contribute. This is one of the main tasks of the intermediary, managing the network and its involved actors (Lee et al., 2010).

**2.1.2 A Framework of the Public Intermediary’s Role**

As multiple policies have been developed to facilitate the innovation challenge in small firms, the public intermediaries, acting as policy makers, have been the center of attention in several articles (Clausen and Rasmussen, 2011). In 2010, Lee et al. developed an intermediated network model, illustrating the direct and indirect support provided by policy makers. According to Lee et al. (2010) the public intermediary should engage in three main activities, constituting the direct support, for the purpose of supporting the networking process of a small firm. First, when the small firm contacts the intermediary for the purpose of finding external actors, the intermediary should be responsible for finding suitable partners to join the firm’s network. By regularly searching for new technologies, market opportunities and competitors, the public intermediary can provide a database of possible partners in order to support the firm. Hence, the first direct support lies in providing access to a **network database**. During the second stage, the intermediary should help construct the network of collaborative partners. The public intermediary can assist this process by suggesting a
network structure, encouraging the creation of local innovation clusters as well as helping with the necessary technology transfers. This second direct support is noted as **network construction**. The final direct support is to provide general management to the network, including consulting in law, tax and finance as well as problem solving assistance. This support is defined as **network management**. Besides these three direct supports, the public intermediary should also offer indirect support by analyzing the culture of collaboration and striving to facilitate it. (Lee et al., 2010)

The framework developed by Lee et al. (2010) centers on the intermediary’s support connected to the involvement of external actors, while not taking the new product development process in account. While Lee et al. (2010) describe the innovation process as hard to manage for the small firm, clearly implying that the intermediary can support this activity, this aspect is nevertheless absent from their suggested framework. Hence, this framework is considered inadequate when searching a model representative of the policy maker’s support and it will only be regarded as a supplementing component to the thesis.

### 2.1.3 Categorizing the Intermediary as an Organization

Howells (2006) acknowledges two different approaches used to examine the intermediary in prior research; the focus either lies on the intermediary as an organization or on intermediation as a process. Studying the intermediary as an organization, Howells (2006) finds four main categories of intermediaries:

1. Diffusion and technology transfer
2. Innovation management
3. Systems and networks
4. Intermediaries as service organizations

According to Howells (2006), the interest for innovation intermediaries emerged from their role in **diffusion and technology transfer**. Diffusion refers to an innovation being spread within a social system, by using certain channels over time. In diffusion, the intermediary can act as a change agent; affecting how fast innovations are assimilated into society. (Rogers, 2003) Furthermore, Howells (2006) concludes that being a part of the technology transfer process is a key activity for the intermediary. According to Watkins and Horley (1986), the intermediary should engage in several activities connected to technology transfer, such as sourcing collaborative partners, packaging the technology, selecting suppliers and providing support in deal making. In addition, the intermediary should help make informal collaborations official, providing assistance with contracts and licenses (Shohet and Prevezer, 1996).

Overlapping the category of diffusion and technology transfer, **innovation management** also incorporates facilitating the process of technology transfer. According to Hargadon and Sutton (1997), securing the transfer of knowledge and technology between people, organizations and industries is essential. In this instance, McEvily and Zaheer (1999) emphasize the importance of regional institutions, aiming to provide a network of actors to firms lacking their own
connections. Hargadon and Sutton (1997) take the view of the intermediary one step further, by proposing that the role of intermediation should include more pro-active involvement in the companies. In addition to facilitating the transfer of knowledge between the different organizations, the intermediary should also be permitted to combine the clients’ ideas into new solutions. By encouraging the intermediary to use its internal expertise, new levels of innovation can be reached. (Hargadon and Sutton, 1997)

While the first two categories mainly elaborate on collaborations between two parties, the systems and networks approach introduces innovation communities, seen as a framework for structuring collaboration between multiple actors. The innovation communities can be regarded as intermediating organizations, aspiring to manage the relations between the actors in a collaborative network (Lynn et al., 1996). This complicated and diverse role of the intermediating organization has resulted in Lynn et al. (1996) referring to them as ‘superstructure organizations’. Howells (2006) emphasizes that these superstructure organizations are active within the public sector as well as the private sector.

When categorizing intermediaries as service organizations, Howells (2006) refers to the context of service innovation in general and knowledge intensive business services (KIBS) in particular. In this case, the intermediating firm constitutes a knowledge-based support for the purpose of facilitating the business processes within the small firm (O’Farrell and Wood, 1999). Even though the intermediary plays an important part in this knowledge transfer, the actions of the small firm are also crucial as it lies in the nature of a service to be co-produced with the customer (Bettencourt et al., 2002).

In this thesis, the organizational categorization will be seen as a supplementing tool, used for further understanding of the aspects connected to the intermediary as a company. However, as the provision of a new product development process is noted as an essential component of the intermediary’s offer, the main focus will lie on the intermediary’s functions in a process perspective. The functions characterizing this perspective are presented in the following section.

2.1.4 The Intermediation Functions in the New Product Development Process

In the paragraphs below, the intermediation functions, as defined by Howells (2006), are listed. The functions are interpreted as following a sequential innovation process; hence, they are presented in a chronological order.

1 The function of foresight and diagnostics is applicable to technology forecasting and roadmapping, defining where to source technologies, as well as to market-related matters such as customer requirements.

2 The function of scanning and information processing includes collecting information about different actors and defining the most suitable actors to be part of the collaborative network. In a broader perspective, the function can also include the selection of collaborative partners.
The function of **knowledge processing and combination/recombination** implies that the intermediary is allowed to modify the collected information, by combining knowledge from different external sources. If operating in a relevant field, the intermediary can also include internal technical knowledge and in-house research in the process.

The function of **gatekeeping and brokering** centers on matchmaking the small firm with potential external actors and brokering the collaboration agreements. As this function includes activities such as negotiation and deal making, it requires an external focus of the intermediary.

The function of **testing, validation and training** uses test chambers and laboratories to perform tests and inspections. The function can also refer to prototyping and testing of the manufacturing processes to be used. Furthermore, a scale-up can be performed in order to detect and eliminate bottlenecks in the manufacturing. The function can also include a validation of the analytic methods being used or refer to the training needed to implement new technologies.

The function of **accreditation and standards** is mainly applicable to intermediaries originating from government laboratories. The function refers to activities such as standard setting and verification.

The function of **regulation and arbitration** includes formal regulation, self-regulation and acting as an informal arbiter, mediating between groups such as costumers and producers. However, the function of regulation and arbitration is noted to be less frequent than the others.

The function of **intellectual property** aims to protect the results of the collaboration. The intermediary gives the small firm counseling, treating the subject on whether to file a patent or not. Some intermediaries also engage in IP management, meaning that they help securing the filing of a patent and manage the process. The function of intellectual property is noted to be an increasingly important area for the intermediary.

The function of **commercialization** aspires to exploit the results of the collaboration. The function includes marketing activities such as market research and the development of a business plan. Furthermore, a sales network can be created, establishing and managing the sales channels. The intermediary can also engage in sourcing potential funding for early stage capital as well as venture capital and help performing a stock market launch. The function of commercialization is noted to be an increasingly important area for the intermediary.

The function of **assessment and evaluation** consists of a general assessment of technologies as well as a more detailed evaluation of already launched technologies. The similarities between this function and the first function (foresight and diagnostics) are
When defining the intermediary’s functions, Howells (2006) simply refers to the process as a linear innovation process, stretching from initial research to commercialization. In this thesis, the process is further defined as a generalized new product development process, as providing an established new product development process is an essential part of the intermediary’s offer to small firms, lacking internal processes. The application of Howells’ (2006) intermediation functions to a new product development process also puts the research of Howells in a closer relation to how the intermediary operates, seen to a micro perspective.

2.2 The New Product Development Process

As the Master Thesis keeps a process perspective of the intermediation functions, further explanation of how such a process could be structured is needed. Both Lee et al. (2010) and Howells (2006) imply that the intermediary is connected to an innovation process, although neither of them elaborates on its key elements or its design.

New product development (hereby referred to as NPD) is the complete process of bringing a new product to the market. The term ‘new product’ has a wide range of definitions although commonly, they are classified as either new to the market or new to the firm. Furthermore, new product development is described as a process of bringing new products to market, and the activities in that process are commonly described to follow a sequential order. (Trott, 2012) Although companies traditionally present their new product development process as a linear model, experienced companies know that the process is often iterative when put to practice (Van de Ven, 1986). This implies that different innovations call for different NPD models. Small firms are particularly scattered in their way of putting new products to market; they are heterogenic (Heydebreck et al., 2000), meaning that a NPD process that suits one business might be completely wrong for another. This demands great flexibility of intermediaries supporting small firms in their NPD processes. In the following section, a selection of NPD models will be presented in order to create a generalized NPD process, which will serve as base for the investigation of the intermediation functions in a micro perspective.

2.2.1 Models of New Product Development

The process of bringing new products to market incorporates a diverse set of fields, such as design, manufacturing, marketing and sales (Trott, 2012). As the activities constituting the process can differ in regards to both context and business fields, it is fairly surprising that several different models of the new product development process have been developed over time.

Ulrich and Eppinger’s Activity-stage Model

A NPD model that has gained a lot of attention in today’s society is the generic development process of Ulrich and Eppinger (2008). The process of Ulrich and Eppinger (2008) is an
activity-stage model, which means that the phases constituting the process are described as the activities needed in order to develop new products.

Concluding that every enterprise is unique in its way of working with innovation, Ulrich and Eppinger (2008) provide a basic process, applicable to a wide range of industries. The process consists of six phases, incorporating the following activities: planning, concept development, system-level design, detail design, testing and refinement and production ramp-up. However, the process can be adapted according to the needs of the company as well as to specific projects. (Ulrich and Eppinger, 2008)

The initial **planning** phase takes place prior to the official start of the project, hence it is often referred to as ‘phase zero’. In this early stage, a strategic perspective is used to estimate the market opportunities as well as the company’s technical capability. This includes a clear definition of the market segments and a rough framework for the product platform. In addition, the strategic planning of phase zero involves finding possible constraints connected to the production process and outlining the supply chain strategy. Involving research as well as finance and general management, the objective of the planning phase is to deliver a project mission statement, complete with business goals and allocated resources to meet the market demand. (Ulrich and Eppinger, 2008)

After finishing the first draft of the project mission statement, the phase of **concept development** can start. In this stage, the selected market segments are investigated in detail, resulting in a mapping of the target customers’ needs. The lead users are identified and as far as possible connected to the project. Furthermore, competing products have to be analyzed in order to make a realistic estimation of the market opportunities. Unsurprisingly, the main focus of the concept development phase is the design of the product. This step involves several activities, such as concept generation, concept evaluation and selection, building and testing of prototypes and setting of final specifications. In this context, a concept is referred to as a description of the design and function of a product, often accompanied by an economic validation. In co-operation with finance, the manufacturing cost should be estimated with regard to the production feasibility. In addition, any existing patents likely to interfere with the chosen concept should be investigated. This activity also opens up for the possibility to file a new patent. (Ulrich and Eppinger, 2008)

In the next phase, the **system-level design** is in focus. The product architecture should be clearly defined, complete with incorporated subsystems and components. Refining the industrial design of the concept, this phase aims to deliver a geometric model of the product as well as a specification of each subsystem. Concerning marketing related matters, the tasks of this phase consist in outlining an extended product family and possible add-on features as well as setting target prices. Furthermore, a successful system-level design should also deliver a framework for the assembly process. This requires a close collaboration with finance, in order to set target costs for manufacturing and perform ‘make or buy’ analyses. In addition, this phase includes contacting suppliers as well as negotiating agreements. (Ulrich and Eppinger, 2008)
When having defined the system-level design, the next step is the **detail design**, setting the specifications for each component. Defining part geometry as well as materials and tolerances, this stage results in a complete control documentation for the product. The documentation includes descriptions of the tools, necessary to manufacture the components in-house, and specifications concerning standard parts to be purchased from suppliers. In correlation with designing the needed tools, procurement of tools with a long lead-time should start. In this stage, the production process should be well defined, complete with quality assurance processes and cost estimations. In addition to the control documentation, the detail design phase should also deliver a marketing plan. (Ulrich and Eppinger, 2008)

In the **testing and refinement** phase, several prototypes are constructed and evaluated. Typically, two types of prototypes are included in this phase. The early prototypes, called alpha prototypes, are usually constructed with materials and geometry authentic to those of the final product. However, they are not necessarily built using the same manufacturing processes as in the future production. After having tested the alpha prototypes, the next generation, called beta prototypes, is constructed. The beta prototypes are more realistic compared to the alpha prototypes, since they consist of parts manufactured within the actual production system. Both kinds of prototypes are going through tests, evaluating their reliability and performance. Aiming to find improvements for the design, the beta prototypes are commonly tested by end customers in their own environment. Other factors to take in consideration are the regulatory approvals, which are necessary to commercialize the product, and hence will possibly affect the final design. Approaching market launch, the sales plan should be outlined and the promotion materials should be prepared for the launching to come. (Ulrich and Eppinger, 2008)

Finally, the **production ramp-up** constitutes the last phase of Ulrich and Eppinger’s (2008) new product development process. For the first time, the product is manufactured using the exact same production system as for mass production, also in terms of assembling the product. During the production ramp-up phase, the work force gets used to the new manufacturing process, while identifying potential problematic areas. The products constructed during the ramp-up are often sent to key customers, who suggest final adjustments based on the user experience. When a satisfying outcome is reached, the production ramp-up gradually progresses into ongoing production. At this point, the product is officially launched and becomes available to the public. (Ulrich and Eppinger, 2008)

The generic process of Ulrich and Eppinger (2008) focus on the activities needed in order to develop new products. These activities will constitute the phases of the generalized NPD process, which will serve as base for the investigation of the intermediation functions in a micro perspective.

**Cooper’s Decision-stage Model**

Cooper’s stage-gate process is one of the most acknowledged decision-stage models (Trott, 2012). A decision-stage model breaks down the new product development process into a
series of decisions, which as a result highlights both the available options and the quality of the information on which to base decisions (Saren, 1984).

Cooper’s NPD process is commonly divided into five stages, where each stage is initiated by a decision point, normally referred to as a gate. During the gate, the senior managers, responsible for the resources needed in the following stage, evaluate the project’s continuation. Thereby, the gates serve as quality controls, embracing a ‘go/kill’ approach. (Cooper and Edgett, 2006)

Regarding the format, the gates consist of inputs, criteria and outputs. The input is the deliverables, such as the outcome of the previous stage or the process prior to the gate. The criteria correspond to the premises on which the project will be judged and could either be of qualitative or quantitative character. Lastly, the output consists of a decision of whether to proceed with the project or not, a priority level, a declaration of necessary resources, an action plan and a date set for the following gate. (Cooper and Edgett, 2006)

The stages in Cooper’s stage-gate process correspond to cross-functional, and parallel activities that allow a high level of flexibility. In order to accelerate a project, modifications such as having overlapping stages, letting projects proceed into the next stage without totally completing the previous or either collapsing or combining stages can be performed. Furthermore, Cooper’s NPD process has a strong market and customer orientation, which increases the possibility of adding value to the customers. (Cooper and Edgett, 2006)

Cooper’s stage-gate process will complement the generic development process of Ulrich and Eppinger by implementing both the aspect of gates and the overlapping of phases in the generalized NPD process, which will serve as base for the investigation of the intermediation functions in a micro perspective.

Trott’s Network Model

By emphasizing the importance of a continuous accumulation of competence in the NPD process, Trott (2012) adds another dimension to the previously described models. Network models are the most recent contribution to new product development and focus on the knowledge accumulation from external actors within the following fields: marketing and sales, finance, engineering and manufacturing and research and development (Trott, 2012). The knowledge is accumulated in parallel with the project progressing and Trott (2012) defines it as ‘a snowball gaining in size as it rolls down a snow-covered mountain’.

In this Master Thesis, the role of the intermediary includes keeping a database of external actors that can be incorporated in the small firms’ innovation projects. As the thesis aims to investigate the intermediation functions connected to the NPD process, the aspect of incorporating the knowledge of external actors, seen in Trott’s network model, is of great interest. Thereby, the aspect of creating a network of external actors surrounding the NPD process will be incorporated in the generalized NPD process, which will serve as base for the investigation of the intermediation functions in a micro perspective.
To further elaborate on which external actors could be included in the intermediary’s database, the actors incorporated in Trott’s network model are presented in detail below. As the thesis focuses on the role of the intermediary when aiding small firms, each description centers on the external actor’s relation to the small firm and its contribution in the NPD process.

**Suppliers**

While several authors (Ritter and Gemünden, 2003; Huizingh, 2010; Tether, 2002) state that a co-operation between the supplier and the small firm is desirable, the interaction between the two companies can be complicated. If the supplier is a strong business partner, the risk of the supplying company dominating the relationship increases (Kaufmann and Tödtling, 2002). Slowinski et al. (2009), suggest the concept of ‘win-balancing’ as a solution to this problem, i.e. that the companies work together to maximize the value of their portfolio of shared projects. While the theory is simple, concluding that the companies should take turns making the decisions in order to find a balance, this can be hard to manage in practice. The supplier is often involved with competing companies, making the small firm question the reliability of the relationship. (Slowinski et al, 2009)

The small firm constantly has to make decisions regarding whether to ‘make or buy’, involving parameters such as transaction costs and the weighing of a long-term strategy against short-term efficiency. Even though a long-term partnership with a supplier usually cannot fully replace an internal R&D department, it can be an important supplement. (Tether, 2002) According to Slowinski et al. (2009), the supplier can be a key source of innovation, sometimes even sharing a technology roadmap with the firm. Exchanging human resources, as well as intellectual property and market analyses, the new product development processes in each firm strongly influence one another (Slowinski et al., 2009). However, Narula (2004) finds that many small firms are too concerned about protecting their innovations to engage with a supplier for the long run. When needing technical support, they choose to outsource the tasks to different companies, assuring that none of them will get a full insight in the firm’s technology (Narula, 2004).

**Universities and Research Centers**

Providing specific expertise and groundbreaking research, universities as well as research centers are popular partners in collaboration networks (Slowinski et al., 2009; Huizingh, 2010; Spithoven et al., 2010; Hemert et al., 2011). Especially among small firms, universities are desirable companions since the relationship implies low competitive and financial risks (Narula, 2004; Chiaroni et al., 2010; Tether, 2002). In addition, Tether (2002) emphasizes the possibility to combine the collaboration with funding from the European Commission, resulting in a profitable way to obtain specialist competence.

Kaufmann and Tödtling (2002) claim that small firms generally do not use external competence enough, and particularly not competence provided by universities and research centers. Agreeing on this matter, Ries (2011) as well as Swamidass (2013) want to see an
increasing rate of collaborations between the academic world and small firms in order to commercialize scientific research. Besides the universities and research centers, there are also other establishments, connected to scientific research, mentioned in the literature as preferred partners. These organizations include educational institutions (Hemert et al., 2011), training institutions (Kaufmann and Tödtling, 2002; Ritter and Gemünden, 2003), laboratories (Slowinski et al., 2009) and technology centers (Kaufmann and Tödtling, 2002).

Competitors
At first glance, competitors can be perceived as suspicious partners in a collaborative network, since it is not in the nature of competing firms to co-operate (Tether, 2002). However, working together for shorter periods of time can benefit both parties (Ritter and Gemünden, 2003; Huizingh, 2010). According to Tether (2002), there are a couple of situations when collaborating with a competitor is considered a viable alternative. The first example refers to competing firms establishing a new standard together, agreeing to base future innovations on the mutually set standard. This is especially applicable to small firms trying to challenge an established market. Another situation, where collaboration can be necessary, is when the competing companies encounter common difficulties, not directly related to their businesses. By working together, their influence on the matter increases and they are more likely to reach a satisfying solution. Finally, the collaboration can be beneficial when the two competing companies’ strengths and weaknesses are compatible. It is not probable that one company is an expert in every field and by knowing the competitor’s strengths, co-operations that are profitable for both parties can be proposed. (Tether, 2002)

Hemert et al. (2011) take the concept one step further, arguing that collaboration with competitors is essential for successful innovation. Providing market insight and allowing the small firm to engage in partnerships, Hemert et al. (2011) conclude that the contact with competitors has a direct correlation to an increased sales performance.

Distributors and Marketers
Being restricted by limited resources, the main objectives for a small firm entering a collaborative network are market-related (Van de Vrande et al., 2009). Similarly, Lee et al. (2010) stress the need for connecting external resources to commercialization rather than to R&D in the NPD process. This approach is not uncalled for, since small firms usually incorporate a lot of knowledge concerning technologies, while lacking the needed expertise for a successful launching of the invention (Narula, 2004).

Having been previously neglected and discarded, current research supports the application of external actors connected to commercialization in small firms (Hemert et al., 2011; Andrew and Sirkin, 2003; Kaufmann and Tödtling, 2002; Heydebreck et al., 2000). The external actors can provide valuable information concerning market development, hopefully resulting in a successful launching as well as stable financial results and a sustainable market share (Van de Vrande et al., 2009). The product launching and its prior activities have been described with various terms, such as commercialization (Lee et al., 2010; Van de Vrande et al., 2009), external exploitation (Lichtenthaler, 2008), distribution (Ritter and Gemünden, 2003) and
marketing (Slowinski et al., 2009; Narula, 2004; Kaufmann and Tödtling, 2002; Heydebreck et al., 2000). In addition, a number of actors providing market insight can be engaged, e.g. futurists (Slowinski et al., 2009), market analysts (Heydebreck et al., 2000) and sales (Narula, 2004).

**Buyers and Customers**
The involvement of buyers and customers in the new product development process includes a wide range of constellations, from dominating customers found in business-to-business (Kaufmann and Tödtling, 2002) to private individuals evaluating new concepts within their area of interest (Ries, 2011). Customer involvement is especially suitable for technically advanced innovations (Slowinski et al., 2009), bringing something radically new to a rather undefined market (Tether, 2002). Small firms have a lot to gain from incorporating customers, since they provide a rather inexpensive source of information, suitable for companies with limited internal resources (Hemert et al., 2011). By addressing its potential customers and providing them with tools to express their innovative ideas, the firm can create a beneficial relationship (Van de Vrande et al., 2009).

According to Hemert et al. (2011), the goal of the new product development process should always be to create customer value. Unfortunately, many companies put a lot of resources into the process of creating a new product just to find out too late that the end customers do not have a need for it (Ries, 2011). In 1986, Von Hippel developed the term ‘lead user’, referring to customers that are advanced users in a certain area, implying that their current needs will be accurate for the rest of the market in a couple of months or years. Hence, the lead users can provide market insight as well as act as a source of innovation, giving ideas and inputs on improvement areas (Von Hippel, 1986). In conclusion, the relationship is shifting, from the customer having to adapt to the new products being developed, to rather have the industry adapt its innovations to the needs and wishes of the customer (Von Hippel, 2005).

**Consultants**
Naturally, a collaborative network, wanting to include various actors, incorporates consultants with diverse skills. Furthermore, the role of the consultant is changing; from providing expertise in a specific phase of the new product development process to being involved throughout the project, aiming to develop long-term partnerships. Although the consultancy firms can be specialized in various areas, they are still often associated with offering technical skills. (Bessant and Rush, 1995) Concerning this matter, it can also be beneficial for the small firm to initiate partnerships with other technology-based firms (Huizingh, 2010; Heydebreck et al., 2000) as well as firms owning patents (Slowinski et al., 2009).

However, consultancy can also incorporate financial services, such as financing institutions (Hemert et al., 2011) and venture capitalists as well as business angels (Slowinski et al., 2009; Swamidass, 2013). In addition, individuals possessing relevant competence can act as consultants within their area of expertise. This type of consultancy includes a wide range of actors, such as retired executives, academics and creative thinkers. (Slowinski et al., 2009)
2.3 Synthesis of the Theoretical Framework

The Master Thesis positions the intermediary in between the small firm and a database of external actors. Keeping this view of the intermediary, the database of external actors is a key element to the role of the intermediary and an incitement for the small firm to seek its support. The varieties of collaboration constellations, as described by Howells (2006), show the different designs in which an intermediary can act, implying that the intermediary’s operations cannot be described with a single constellation. In the thesis, the collaboration constellations will solely be indicated as internal or external, generalizing the terms presented by Howells (2006).

Researching the role of the intermediary, Howells (2006) summarizes previous studies of innovation intermediaries into four categories. The role of the intermediary can be studied in either an organizational perspective or a process perspective (Howells, 2006). As the thesis puts the intermediary in a process perspective, the four categories serve as a complement to the intermediation functions. Howells (2006) presents the intermediation functions in a sequential order, which is interpreted to follow Howells’ view of the innovation process. Lee et al. (2010) describe the role of the public intermediary to include network management, an element that is not included in Howells' (2006) functions. Neither the distinction between direct and indirect support is elaborated by Howells (2006).

The theoretical framework presents three models of new product development. The diverse nature of the processes indicates the complexity and variations connected to NPD. The generic development process of Ulrich and Eppinger (2008) is seen to cover a great spectrum of activities connected to NPD and the gates in Cooper’s stage-gate process are interpreted as a tool to structure the NPD process and assure quality to the result. As the thesis refers to the intermediary role as including a database of external actors, the external input in Trott’s (2012) network model is interpreted as an example of such a database. Thereby, the actors acknowledged by Trott (2012) are further elaborated on in order to show the diversity of the database.
3 Method

Since the functions of the different types of intermediaries during the NPD process are rather unexplored, a qualitative method is suitable for the purpose of investigating the subject (Eisenhardt and Graebner, 2007). Combining theory and empirical data, an abductive study will be performed. Traditionally, one separates inductive and deductive research, implying that the inductive method builds its own theory from empirical evidence, e.g. case studies. The deductive method, on the other hand, relies on an existing theoretical framework, which is later tested by collecting empirical data. (Eisenhardt and Graebner, 2007) By choosing an abductive study, these two methods can be combined using what is often referred to as “inference to the best explanation”. Aiming to find the most probable explanation, empirical data is collected and put in the context of a theoretical hypothesis. Focusing on probability, the conclusion of an abductive study does not follow with absolute certainty from the premises. However, the abductive method is crucial for investigating new areas, and hence is a suitable method for scratching the surface of this topic. (Walton, 2005)

3.1 Comparative Case Study

The thesis is conducted using a case study methodology, comparing two different types of intermediaries – a public and a private. A case study is used when seeking to examine a contemporary phenomenon in depth and in its rightful context. Furthermore, it is an appropriate method when trying to answer questions phrased with why or how. (Yin, 2009) As the concerned research question is explorative in its nature, the application is suitable for the study at hand. This case study addresses a comparison between two contrasting cases, corresponding to the sampling approach noted as ‘polar types’ by Eisenhardt and Graebner (2007). In a micro perspective, the public and the private intermediary represent two extremes and consequently a comparative case study methodology will be used.

The public and private preconditions constitute the main differentiator between the two cases. However, even though both companies act as an intermediary in the NPD process of small firms, there are differences to the services they provide. The intermediating function is commonly seen in the public sector, although as the current conditions increase its importance, it is spreading to organizations within the private sector as well. In order to compare the intermediation functions within the public and the private sector, the following companies are chosen for the study:

**Case 1:** A state-owned company, working to support innovation projects with advice as well as financial means, and regarded as a public innovation intermediary, consistent with Bakici et al. (2013). Among its internal services, the firm provides coaching and mentorship programs to companies ranging from start-ups to more established, larger companies.

**Case 2:** A consultancy firm, specialized in R&D, and regarded as a private intermediary, consistent with the description by Bessant and Rush (1995). Together with its sister company,
the firm provides internal services within design, prototype building, testing, certification and production.

### 3.1.1 Primary Data Collection

The case studies are based on a primary data collection, consisting of semi-structured interviews with the two intermediaries as well as corporate documentation intended for internal use within the intermediary firms.

**Semi-structured Interviews**

The interviews held with the intermediaries are semi-structured, following a predetermined theme while still being open for modifications. A semi-structured interview combines the ease of an unstructured method and the predefined interview protocol of a structured method. It allows the interviewer to ask probes to the questions in the protocol, which incorporates guides to the information needed from the interviewee. (Bernard, 2011)

When performing a qualitative research, it is common to study a small sample of people. In this thesis, a purposive sampling has been performed, meaning that the interviewees are carefully chosen. (Miles and Huberman, 1994) The semi-structured interviews are held with a representative from each of the two investigated intermediaries. In case 1, the representative is a senior Innovation Advisor. Having been involved in approximately 11,000 innovation projects on account of the public intermediary, the innovation advisor possesses a profound experience in intermediating the NPD process. In case 2, the representative is an Area Manager at one of the offices of the consultancy firm. The Area Manager is ultimately responsible for all projects conducted by the consultancy firm in the concerned geographic area and hence is the most qualified person to answer questions about the private intermediary’s functions during the NPD process. Both interviewees have an extensive knowledge and understanding of the NPD process as well as the actors involved, which make them eligible participants to this thesis. Furthermore, they are both active in the same regional area in Sweden.

The interviews have a time frame of two hours and are held in conference rooms at each of the intermediaries’ offices. Mainly treating the subjects of the NPD process and the involvement of external actors, the questions aim to investigate the different functions provided by the intermediary. Each question is followed by probes, which are adapted to the interviewees’ answers and seeking to help ascertain responses. The interview also incorporates a practical element, with the purpose to efficiently generate a consistent perception of the intermediation functions during the NPD process. During the practical element, the interviewee is handed a white paper in size A2. The paper shows a simple timeline, illustrated with a black arrow. Furthermore, the interviewee is handed a sample of 30 cards, symbolizing different actors that are frequently involved in the NPD process. Every card has the name of an actor written upon it, e.g. project leader, mechanical engineer, business coach and marketer. First, the interviewee is asked to describe the activities during the NPD process and divide the timeline in different phases according to the NPD process used by the intermediary. In the next step, the interviewee is asked to place the actor cards on
the timeline to illustrate in which phases of the process each actor is usually contributing. The practical element investigates the intermediation functions during the NPD process, aiding the interviewee to illustrate its process and diminishing the risks of confusion or forgetting a key element. In order to prevent information from being lost, as a cause of human error, notes are taken during the interview, which is also recorded.

**Corporate Documentation**

For the purpose of validating and supplementing the information collected during the semi-structured interviews, internal corporate documentation is studied. When investigating the intermediation functions during the new product development process, the most essential documentation is the NPD process of each intermediary. The NPD processes are presented for internal use and include detailed instructions of how to apply the process to a project. To this comparative case study, the documentation contributes an additional aspect of comparison amongst the two intermediary firms as well as an opportunity to verify the knowledge of the interviewee. To summarize, the internal documentation of the new product development process elaborates on:

- The specific activities during the process
- The allocation of resources during the process
- What is required of the small firm during the process
- What is required of the intermediary during the process
- The purpose of the process
- How to simplify the process when presenting it to the small firm

### 3.1.2 Secondary Data Collection

Secondary data is information collected from prior research, e.g. it can be an annual business report or primary data collected by other researchers. The main difficulties when collecting secondary data are to find the right sources and to assess the relevance of the data connected to the own investigation. (Hox and Boeije, 2005) The secondary data to be used in this thesis comes from a literary analysis as well as publically accessible information published on the intermediaries’ web sites.

The literary analysis is strictly focused on research-specific literature, such as books and academic articles. The primary databases used are: Business Source Premier, Academic Search Premier, ScienceDirect, Google Scholar and the Linköping University library. Providing the premises of this thesis, Howells (2006) is regarded as a key reference.

The publically accessible corporate information functions as a supplement to the primary data, providing for example background information on the two case companies.

### 3.1.3 Method of Analysis

As mentioned earlier, the semi-structured interviews were recorded and protocols were carried out. The first step of the analysis was to complement the protocols conducted during the
interviews with transcriptions of the recordings. The results from each of the interviews were then grouped according to the sequential order of the intermediaries’ innovation processes. In order to assess the level of comparability between the two cases, a simple evaluation of the results was performed. Thereafter, the empirics were supplemented and validated by the internal corporate documentation for each of the two intermediaries. To achieve a truthful comparison between the public and the private intermediary, an investigation framework was created. The main attributes of the new product development models presented in the theoretical framework were merged into a generalized NPD process, in line with the thesis’ view of the innovation process.

The generalized process serves as base for the investigation of the intermediary’s functions. Hereby, the NPD process is seen as a process incorporating the following attributes:

- The activity-stages from Ulrich and Eppinger’s activity-stage process
- The gates and overlapping of stages from Cooper’s stage-gate process
- The network of external actors from Trott’s network model

The focus of the thesis is to investigate the role of the intermediary in a micro perspective, applying Howells’ (2006) intermediation functions to the NPD process of a public and a private intermediary. With the investigation framework as base, the NPD processes of the two intermediaries were first analyzed by connecting the phases of the intermediaries’ processes to the ones in the generalized NPD process. Once the phases correlated, the analysis was performed phase-by-phase, evaluating the presence of the intermediation functions in the support provided by each of the intermediaries. The functions were analyzed based on their character, if provided internally or externally and to which extent the intermediary provided them. At the end of each phase, the acknowledged functions were summarized in a table (similar to Table 1).

![Table 1: An example of the tables used in the analysis.](image)

3.2 Critique of Method

Although the methods used in this thesis are carefully selected to insure a high quality to the research at hand, there are several aspects that might tamper with the results to be taken in consideration. When using interviews as a technique to gather primary data, it is crucial that the interviews keep a consistent approach to be able to compare the results and make a truthful analysis. There are several aspects that might affect the results of an interview, e.g. the chemistry between the interviewer and the interviewee or the state of mind of the interviewer, when holding the interview. It is also important to avoid leading questions or to
reel off many questions at the same time, as it might confuse the interviewee. Lastly, the secondary data needs to be gathered in a systematic manner, as it is a time consuming endeavor and the relevance of the data must be kept high. As mentioned in the beginning of this chapter, the fact that the subject of the thesis is rather unexplored enhances the difficulty to find relevant information among previous research.
4 Results

In this chapter, the results obtained during the interviews with the two intermediaries are presented in two separate cases. Each case consists of a background summary of the company as well as a description of the NPD process, which is structured according to the generalized NPD process presented earlier (3.1.3 Method of Analysis). However, the activities of system-level design and detail-design have been merged, constituting one single phase in both of the intermediaries’ NPD processes. Merging the phases corresponds better to the actual NPD processes, being used by the intermediaries, and consequently makes a more accurate illustration of the intermediation functions in the phases of the NPD process.

4.1 Case 1: Public Intermediary

The information presented in this section is a summary of the interview conducted with a senior Innovation Advisor from the state-owned firm, acting as an intermediary in innovation projects. Supplementing the empirical data, internal corporate documentation as well as information published on the intermediary’s official web site has been used.

4.1.1 Company Description

Being partly state-owned and partly owned by the local federation, the company studied in the first case is regarded as a public intermediary. Overall, the intermediary has a clear focus on business and innovation, offering services such as business coaching, business counseling, mentorship programs and innovation advising. In addition, the public company provides financial support, ranging from loans with conditions intended to be beneficial for small firms to more strict loans of higher amounts. Being supplemented by its subsidiary, a company focused on investments, the intermediary can also supply selected companies with venture capital. Since the partially state-owned company is committed to the mission of strengthening the Swedish industry, its presence in each region of the country is essential. Consequently, the company has a total of 40 offices, distributed all over Sweden, while the headquarters are located in Stockholm. In total, the intermediary has approximately 450 employees, divided between the different offices. This number classifies the intermediary as a large company.

4.1.2 The New Product Development Process

The following section clarifies how the public intermediary runs its organization and is a declaration of the obtained empirical evidence emerged from the semi-structured interview held with the senior Innovation Advisor as well as internal corporate documentation regarding the NPD process. The structure consistently follows the activity-stages of the generalized NPD process. In each stage, the firm-specific activities, gates, overlapping of phases and involvement of external actors are further elaborated on.

The projects supported by the intermediary vary in length, depending on the type of product as well as the firm or innovator behind the idea. According to the Innovation Advisor, the shortest project lasted for a little bit over three months. In this case, the first prototype was constructed at the first meeting between the intermediary and the small firm. However, the
longest project continued for nine years, due to standards affecting the product development. Usually, small firms and individual innovators need about three years to successfully develop and commercialize the idea.

Planning
When the small firm comes to the intermediary, the material presented varies in extent. Some firms do not even have an idea, but have merely identified a problem that needs solving. In this case, the project starts with an observed need, which is then investigated in order to see if a solution is possible. On the other hand, there are also established companies that come to the intermediary with complete technical drawings of the product they want help creating. For example, it might concern an update for an already existing product and then the firm already knows exactly what kind of support it is in need of. Sometimes even the small firms and individual innovators bring prototypes to the first meeting. This is the case for an increasing number of small firms and individual innovators who tries to create prototypes at home, using a 3D printer. The 3D printers permit persons possessing a great interest in technology to develop prototypes themselves, which can lead to exciting results. Although, the Innovation Advisor notes that it is not always considered positive to create the prototype at such an early stage, since it limits the innovator to its own solution without considering alternative approaches.

If the small firm is inexperienced, the first issue of the planning phase is usually to decide whether to proceed with the project or not. Consequently, the focus lies on an analysis of needs during the first meeting. The analysis is merely a discussion, where the intermediary and the firm look for information on the Internet. Since no external services are purchased, there is no money involved during this phase. Nevertheless, external actors can still be tied to the project in this early phase, even though they are not actively contributing until the later phases. As commercial and environmental sustainability have increasingly become the heart and center of the public intermediary’s concern, a close collaboration with the university has emerged, as the university holds a high level of competence in the specific area. Other external actors applicable to the planning phase are consultancy firms, market analysts, lawyers, patent engineers, suppliers, end customers and competitors. Here, competitors are not perceived as partners but rather as guides to a well-planned market positioning. Furthermore, the intermediary’s internal services during this stage include mentors, account managers and innovation advisors.

At the first meeting with the Innovation Advisor, the small firm is handed a number of forms, consisting of various questions. Usually, the firm is asked to answer the forms at home, i.e. the intermediary gives the small firm homework. Based on how the firm handles this exercise by its own, the intermediary can assess its motivation. In addition, the Innovation Advisor argues that the intermediary can evaluate the innovator’s verbal ability as well as sense of logic through the forms. The second meeting between the small firm and the Innovation Advisor is devoted to evaluating the homework.
Gates
In the planning phase, the meetings with the Innovation Advisor can be perceived as gates. During the first meeting, the focus lies in whether to proceed with the project or not. This decision is made by the intermediary and based on the analysis of needs. If passing this gate, the firm is handed formularies to be completed as homework for the next meeting. The second meeting also functions as a gate, since the intermediary decides how to proceed with the project depending on the results of the homework. If the firm shows that it is qualified to perform the project, the project usually passes the gate and advances to the concept development phase.

Concept Development
During the concept development phase, approximately four or five meetings take place between the intermediary and the small firm. In these meetings, the organizational structure is being discussed and a project leader is decided on. Although, since it is usually the innovator that leads the project, the project leader can be regarded as connected to the project already in the planning phase. According to the Innovation Advisor, the project leader needs to come from within the small firm and this is, in fact, a crucial criterion in the continuation of the project. If there is a lack of such an actor in the initial organization of the small firm, the project needs to be supplemented by an external project leader.

In the concept development phase, the analyses that started in the planning phase are advancing to include purchasing of technical reports and market analyses, which serve as the base for assessing the project’s potential. The reports are bought in order to analyze whether the idea at hand is newsworthy, technically feasible and have commercial potential. These reports are bought from actors ranging from mechanical engineers to trend analysts and patent engineers. These types of specialists within the development industry – web designers, electronics engineers, industrial designers, mechanical engineers, software developers, calculators, graphic designers, testing engineers and quality engineers – are all considered technical developers, according to the Innovation Advisor at the public intermediary.

As the internal competence of the public intermediary focuses on business coaching and innovation advising, there is a significant need for external actors within concept development, as no such competence exists within the intermediary’s organization. When selecting external actors, the public intermediary is inclined to be completely impartial, not affecting the network constellation of the project. However, the Innovation Advisor acknowledges that the intermediary in fact gives indirect recommendations to its customers in order to secure an efficient process and avoid the projects from being sidetracked.

Furthermore, the intermediary also uses trade associations to get a hold of valuable statistics on sales to the market analyses. In combination with declarations provided by certification bodies, this valuable information helps form the concept in this phase. Certification bodies are common in the network of external actors, due to the importance of knowing what certifications, stamps and test approvals are necessary for a certain project. Although at this
stage, the certification bodies are involved purely to gather information and create an awareness of the certifications relevant to the project. The certification bodies constitute a more substantial part of the NPD process later on, when the product is put to market.

The public intermediary provides different types of funding of the projects that are supported through its process. This kind of internal funding enters in the concept development phase and implies that the public intermediary starts to partially finance the project. Individual innovators can receive a maximum amount of 25 000 SEK, while firms can get a contribution of maximum 50 000 SEK. Usually, the money is used for concept development, for example by hiring a consultancy firm within R&D. As mentioned, the consultancy firm can be appointed for advice already in the planning phase, but is not hired until the concept development phase. The need for external financing varies, depending on the size and type of the project. If it is a simple product, venture capital is usually not necessary and the concept is merely adapted to be presented to the end customers, licensees or partners. Nevertheless, the end customer can also be regarded as a financier. At times, projects are completely financed by the small firms’ customers, who even help with the new product development. This phenomenon, if concerning B2C projects, is commonly known as crowdfunding. However, customer financed projects are more common within the industry, referring to B2B projects. The public intermediary expresses that the projects with the best outcome are the ones that have been developed together with customers.

The goal of the concept development phase is to package the idea so it can be presented to the small firm’s end customers or to a potential financier. As the concept is being developed, plans for distribution channels are discussed and decided on. Although, at this stage, there is merely an awareness of how the product will be distributed.

Gates
Before proceeding to the next phase, a complete project plan should be handed to the Innovation Advisor. The validation of the project plan constitutes a gate. Furthermore, the proper packaging of the idea, making it presentable to potential end-customers as well as financiers, is a gate.

System-level Design and Detail Design
The following phase corresponds to the activities of system-level design and detail design, having its focus set on further development of the product. However, the procedure can vary depending on if it is a physical product, a software solution or a service. If it is a physical product, the production facilities enter the NPD process in this stage.

Since the project should be presentable to the market at the end of the concept development phase, sales personnel are introduced in order to generate customers to the product being developed. Accountants are involved as the project starts to cost a significant amount of money in this phase. Furthermore, business coaches can enter the process and stay involved
until project termination. The chosen distributors, mentioned in the prior concept development phase, start to fully engage in the project.

The phase continues until the first business deal is sealed. Here, the term ‘business deal’ incorporates a range of scenarios, from selling a first unit and sending a first invoice to signing a license or receiving venture capital. However, the product does not have to be complete when leaving this phase, as the focus only lies in the first closed deal.

**Gates**
The gate in the phase of system-level design and detail design consists in sealing the first business deal. This gate permits an overlap, as the product can be further developed and tested in the following two phases and as it can be hard to separate the first business deal from the subsequent.

**Testing and Refinement**
The phase of testing and refinement is not elaborated on when interviewing the Innovation Advisor. As the testing and quality engineers contribute with their expertise as early as in the concept development phase, it is implied that they get practically involved in the later phases, performing the planned tests. However, the Innovation Advisor does not describe these tests, as external actors at external production facilities perform them. In the testing and refinement phase, it is also implied that prototyping is a central activity, also handled by the external production facility. The Innovation Advisor emphasizes the advantages of postponing the prototyping to the final phases of the NPD process, as using a prototype as a starting point indicates a narrow concept generation and hence an inferior result.

**Gates**
No specific gates are detected in this phase.

**Production Ramp-up**
Constituting the last part of the NPD process, the production ramp-up can proceed for a long period of time. During this phase, the public intermediary is mostly focusing on taking the finalized product to market launch. Consequently, the business development that started during the phase of system-level design and detail design should be increasing. Even though external financing can enter at any time during the NPD process, it is most common in the beginning of the production ramp-up. In this stage, the project is also open to integrating venture capital, which the intermediary does not recommend in earlier stages.

According to the Innovation Advisor, a successful commercialization implies that the point of break-even is reached, meaning that the product stops being a loss for the firm and starts being profitable. In order to reach this point, business deals should be closed on a regular basis. Often, the small firm suffers from an over-confidence regarding how the product will be received when released on the market. Even though the competitors have been taken in consideration during the entire NPD process, it is not until the commercialization that they
pose a threat. If the product is not launched at the right time or if it does not match the end customers’ needs, it does not matter how much experience the firm has; the success will fail to arrive.

The collaboration between the public intermediary and the small firm is terminated at the end of the production ramp-up phase. However, the intermediary monitors the project and does follow-ups after two and five years. This is partially due to a requirement from the Ministry of Enterprise and Innovation, regulating the work of the public intermediary. It lies in their interest to investigate the intermediary’s performance as well as the results of the firms that have been supported. The public intermediary also has a close collaboration with the local business incubator, as the small firms usually need long-term coaching in order to further develop their business. Thereby, business incubation is a recommended path for the small firms and the Innovation Advisor addresses the fact that a great part of the companies supported by the local business incubator has gone through the public intermediary’s NPD process. In addition, several firms return to the intermediary when they need support during new projects. If it is an innovative firm, the collaboration with the intermediary is usually not a one-time event. However, the Innovation Advisor acknowledges that the level of learning is low among the small firms, since they require the same amount of intermediary support when returning with a new idea.

Gates
During production ramp-up, a gate lies in deciding to officially launch the product. Furthermore, the decision to terminate the collaboration between the intermediary and the small firm represents the final gate.

4.2 Case 2: Private Intermediary

The information presented in this section is a summary of the interview conducted with an Area Manager from the consultancy firm, acting as an intermediary in innovation projects. Supplementing the empirical data, internal corporate documentation as well as information published on the intermediary’s official web site has been used.

4.2.1 Company Description

As mentioned earlier, the private intermediary is a consultancy firm, mainly active within R&D. Its internal expertise includes mechanical engineering, calculations, industrial design, electronics, software development, project management, quality engineering and testing. Completing the offer of the intermediary, its sister company provides a production facility to be used for prototypes as well as mass production. The production facility is located next to the consultancy firm’s headquarters in Stockholm. In addition to the head office, the intermediary also has offices in the Swedish cities of Uppsala, Lund, Linköping and Karlstad as well as in Oslo, Norway. In total, the consultancy firm employs about 75 people, divided between the six offices. The number of employees classifies the consultancy firm as a medium sized company, although it is rather small when taking into account that a medium sized firm can employ up to 250 people.
4.2.2 The New Product Development Process

The following section clarifies how the private intermediary runs its organization and is a declaration of the obtained empirical evidence emerged from the semi-structured interview held with the Area Manager at the investigated company as well as internal corporate documentation regarding the NPD process. The structure consistently follows the activity-stages of the generalized NPD process. In each stage, the firm-specific activities, gates, overlapping of phases and involvement of external actors are further elaborated on.

The consultancy firm has a diverse set of customers, all with varying needs. This challenges the intermediary to adapt the NPD process to different industries and to the demands from the customers as well as from external parties. The strong R&D focus allows the intermediary to keep the greater extent of the technical development in-house. Although, there are limits to what the intermediary can accomplish and each project calls for different constellations of actors to contribute to the new product development. In general, the projects handled by the private intermediary last between one and three years. This time span includes every activity, from the small firm describing the idea to the intermediary to the mass production of the product.

Planning

Initially, the firm presents its idea at a physical meeting, either at its own office or at the office of the intermediary. During this meeting, the firm describes the goal of developing the idea, while also picturing the journey towards the goal. Generally, the firm has given its invention a lot of thought before contacting the consultancy firm, resulting in a rather profound idea of what the process should look like. In this case, the intermediary’s task is to summarize the thoughts of the small firm in a mission statement, securing that both parties have the same view of the process to come. It is the project leader along with the account manager, both constituting the intermediary’s internal personnel, who perform this task. According to the intermediary, the mission statement is the first version of the requirement specification, showing the requirements of the customer as well as the constraints connected to the project. In addition, the requirement specification should include a benchmarking of competing products. Sometimes, the firm has already prepared a complete requirement specification when first meeting the intermediary. However, this scenario is more likely for established companies than for small innovative firms. Depending on the previous experience of the small firm, the first presentation of the invention can vary from a short verbal description to sketches and physical prototypes. The material created by the small firm serves as the foundation for the intermediary’s work to come, starting with preparing a feasibility study.

The information collected through the idea presentation and the mission statement constitutes the base of the feasibility study and is summarized in a requirement specification. During the feasibility study, several actors are connected to the project. If demanded by the small firm, an analysis of the market opportunities can be performed, involving external actors such as trend analysts and market analysts. Preferably, the end customer can be incorporated throughout the project, acting as a discussion partner and contribute with market competence as well as
support during the project. When specific competence is needed within an area not covered by
the intermediary’s expertise, specialists, research centers and mentors, such as senior business
partners, can constitute a support. These actors usually enter the project in the end of the
feasibility study and then stay involved until the concept is ready for testing and refinement.

As the focus during the feasibility study lies in creating a requirement specification, many of
the intermediary’s internal actors can contribute. For example, mechanical engineers,
electronics engineers, calculators, software developers and industrial designers are actors
whose competence can be valuable in order to successfully evaluate the project and plan the
future testing, prototypes and certifications needed. If involved during the feasibility study,
these internal actors commonly contribute throughout the project.

Besides making sure that the small firm and the intermediary agree on the goal of the project,
the feasibility study also has the purpose of identifying risks early in the process. By
identifying technical risks as well as manufacturing risks in the feasibility study, the following
phases can aim at eliminating the risks. Being aware of the major difficulties, before starting
the concept development, increases the control of the project and encourages solutions solving
the defined risks.

As funding is critical to the development of the small firm’s ideas, public financiers are
common actors in the NPD process. In projects where funding is particularly critical, the
intermediary works with the local university. The project can then be continued as a master
thesis and students, eager to learn, can contribute with the necessary competence.

**Gates**

Before progressing from mission statement to feasibility study, the consultancy firm gives the
small firm an offer for the costs of the study, constituting the first gate in the intermediary’s
NPD process. Estimating the costs of the next steps in the NPD process is a common practice,
applied throughout the intermediary’s NPD process. In order to estimate the costs, a detailed
plan needs to be conducted, permitting the small firm to decide whether the collaboration
should continue or not. Although not being developed until later on in the project, prototypes
constitute a significant cost for the small firm and need to be specified already in the initial
phase of the NPD process.

**Concept Development**

Following the feasibility study, the next phase investigates the possibilities and limitations of
the idea even further. The aim is to refine the concept and, in some occasions, collaborations
with external industrial designers are introduced. This phase often involves a patent analysis
for the purpose of mapping the competing patents as well as estimating the opportunities of
filing a new patent. The same patent engineer can also be contacted later on in the process, if
the intermediary finds that the concept has potential for filing a new patent. Even though a
patent might not be an option, the existing competitors should always be examined. Usually,
there are numerous competitors and substitutes already established on the market, competing
by fulfilling the same need as the small firm’s invention. The challenge lies in positioning the invention on the market and emphasizing its advantages compared to the competitors. Furthermore, an analysis of potential customers is a frequent feature during the concept development. The customer analysis functions as a base for understanding the customers as well as for defining a design appealing to the target group. In addition, testing engineers as well as quality engineers are often consulted in this phase. These engineers are mainly contributing with theoretical knowledge, identifying the future testing needed in order to secure that the product fulfill the requirement specification. However, they return in the later stages of the NPD process, where they are more practically involved in the testing and refinement. Furthermore, distributors can be contacted during the concept development phase, intending to plan the future distribution channels of the concept.

Gates
When the concept development is finished, all the necessary data should be collected. This stage also includes creating a project plan, defining the resources needed throughout the project. In addition, a verification plan, explaining which features should be tested on each prototype, should be produced during the concept development. The objective is to align the prototype testing with the risks, already defined in the feasibility study. Together, the project plan and the verification plan constitute the second gate in the private intermediary’s NPD process.

System-level Design and Detail Design
After having decided on a concept, production partners are connected to the project and the activities are centered on construction. The internal production facility, as well as external production partners, can be appointed in this phase. Concerning components not manufactured from scratch, suppliers are contacted. The actors entering the project during the phase of system-level design and detail design are production-based and hence usually stay involved during the testing and production ramp-up. Occasionally, the intermediary also ties other consultancy firms to the small firm’s project. In that sense, the intermediary is extending its network of partners to even include its own competitors. For example, this might occur if a project is too big to be developed solely by the intermediary but the gains are too high to decline the proposal.

Gates
As in the previous phases, a gate including a detailed plan and an estimation of the costs for the following phase is conducted.

Testing and Refinement
After the phases related to concept development and design, testing and refinement follows. However, this part of the process contains iterations, resulting in loops back to the previous phase. If the prototypes do not pass the tests, the loops can be repeated multiple times before a successful test can be conducted. It is rather a rule than an exception that this phase requires iterations back to concept development in order to make adjustments to the concept.
In testing and refinement, the focus lies on performing the previously planned tests on the concept. Once again, the testing engineers as well as the quality engineers are involved in the NPD process. The tests are often connected to certain certifications, required for the product. Hence, the concerned certification body enters the process in the testing and refinement phase. Certification bodies always take part in the private intermediary’s NPD process, as it is essential to meet the criteria of certain certifications in order to successfully launch a product on the market.

**Gates**

Each iteration back to concept development, system-level design and detail design requires planning, and the aspect of keeping the small firm informed of costs remains.

**Production Ramp-up**

The following stage is the production ramp-up, where a first batch is produced, using the same manufacturing process as for the planned mass production. The number of units in the first batch can vary, ranging from approximately three to twenty items. Aiming to secure the quality of the mass-produced units, the production ramp-up is used to investigate the statistical outcome of the process. For example, the technical drawings, generated during concept development, have certain tolerances that should be respected when the product is to be mass-produced.

The production ramp-up incorporates the product industrialization, where the focus lies in defining assembly instructions. In some occasions, there are external manufacturers, performing in-line tests on their specific components before delivering them to the consultancy firm’s production facility. These early in-line tests are crucial for avoiding malfunctioning components to be built in to the product. The production partners and suppliers, incorporated earlier in the NPD process, become more operationally active. Besides the manufacturing of the product, the operations connected to logistics constitute an important aspect. Depending on where the product is to be shipped, the requirements on the packaging can vary. The distributors, already contacted during concept development, start managing the distribution channels. When needed, additional logistic partners, such as warehouses are involved. In order to secure that the demands are fulfilled, tests are performed by packing the product and exposing it to vibrations. This is the last step before releasing the product and letting it proceed into mass production.

Incorporated in the production ramp-up is the project termination, where the intermediary assesses and evaluates the collaboration. The collaboration between the intermediary and the small firm usually ends when the product has obtained its CE marking and advances to mass production. The manufacturing of the product can either be handled by external partners or by using the internal production facilities of the sister company. In this final stage, the product development, as well as the testing and certification, is finished and the project is completely documented. Permitting the intermediary to go back and trace the decisions made during the process, the documentation is an essential part of the project termination.
Although having finished the collaboration, the intermediary usually stays in touch with the small firm. The main objective of the close contact is the possibility of new business within a couple of years, given that the small firm’s product has a successful launching and the firm continues to grow. According to the intermediary, the actual success of the small firms is more rewarding than receiving good reviews from the supported firms.

In addition, the previous projects are often used in the marketing of the consultancy firm. During presentations, the earlier projects can be used as examples, showing the variety of the firms supported by the intermediary. The projects can also be published on the consultancy firm’s website and blog as well as in social medias. In some cases, the product is the topic of a press release or advertised in a journal. Usually, the small firm is positive to this kind of publicity, since it also serves as marketing for the own product. The intermediary’s prospect is to promote its customers, while also creating positive publicity for the intermediary itself. If the firm is not yet established on the market, closing deals with customers as well as suppliers can be challenging. In this case, the consultancy firm can serve as a guarantor for the small firm, securing that it will have the resources to keep its part of the agreement. This is a marketing advantage for the small firm, permitting it to participate in procurements.

**Gates**

As in the previous phases, detailed plans before progressing from one step to another are conducted. In this case, they are conducted when advancing from production of the first batch to industrialization and when advancing to project termination. During all gates in the private intermediary’s NPD process, it is the small firm that acts as senior management and decides whether to proceed or not (similar to Cooper’s ‘go/kill’ approach). However, the consultancy firm provides the small firm with the necessary details in order to make a decision.
5 Analysis

Initiating the analysis is a short categorization of the two intermediating organizations, based on Howells’ (2006) organizational categories. However, the main part of the analysis is dedicated to acknowledging the intermediation functions, provided by the intermediaries in each phase of the generalized new product development process.

5.1 Categorizing the Intermediary as an Organization

Both case companies are included in the first category, **diffusion and technology transfer**, as both intermediaries are involved in the technology transfer process. Nevertheless, the private intermediary is part of the transfer process to a greater extent than the public company as it is legally allowed to actively select external actors and manage the contracts and licenses.

The second category, **innovation management**, is also applicable to both cases as both intermediaries facilitate the process of technology transfer by combining ideas from different external actors. As McEvily and Zaheer (1999) accentuate the importance of regional intermediaries during this process, the strong regional focus of the public intermediary should be acknowledged. Even though the private intermediary is not as geographically centered, it compensates for this by being able to combine external knowledge with in-house technology, taking the collaboration to the next level of innovation according to Hargadon and Sutton (1997).

Furthermore, the third category of **systems and networks** is also accurate for describing both intermediary companies. Both intermediaries offer the small firm access to a database of external actors and help construct collaborative networks suitable for each specific project.

Finally, the fourth category, **intermediaries as service organizations**, is hard to relate to any of the case companies. Partially, the public intermediary advises the small firm on how to organize the internal business processes, but this is merely an indirect support as the public intermediary transfers the small firm to the local business incubator.

To summarize, the categories of diffusion and technology transfer, innovation management and system and networks are accurate for categorizing both cases. As two contrasting intermediaries are classified as similar organizations according to Howells’ (2006) categories, this method is concluded to be too general and consequently also inadequate.

5.2 The Intermediation Functions in the NPD Process

In the following section, Howells’ (2006) process perspective of the intermediation functions is applied to the new product development process, analyzing the empirical evidence. For every phase, the acknowledged functions are analyzed for the public as well as the private intermediary. In addition, the nature of the function is analyzed, specifying if it is internally or externally provided.
5.2.1 Planning

Below, the intermediation functions identified during the planning phase are presented and analyzed.

**Foresight and Diagnostics**

Both intermediaries provide the function of foresight and diagnostics, although there are differences to what is performed and to what extent. The public intermediary focuses on investigating the current market and develops an analysis of needs in cooperation with the small firm. Since no money is being spent in this phase, the public intermediary performs a simple search on the Internet. This implies that the initial technology forecasting leading to customer requirements is dependent on the public intermediary’s internal knowledge. The private intermediary can provide an extensive support within foresight and diagnostics as it has a good understanding of technical innovations on the market. Technology being the core focus of the private intermediary, suggests that the mission statement it develops is more technology-specific than the analysis of needs performed by the public intermediary. The purpose of the mission statement is to assure that the small firm and the intermediary have the same understanding of what is expected from the collaboration, which is a necessity since the small firm is paying for the services of the intermediary. Furthermore, the mission statement evolves into a feasibility study, incorporating the potential risks connected to technique and manufacturing, which further enhance the technology-focus of the private intermediary and separates the function from what is provided by the public intermediary.

An analysis of needs incorporates the end customers’ point of view, which is addressed in both cases. Although not buying the services from external actors in the planning phase, the public intermediary sometimes involves their competence early. In this sense, the public intermediary extends its internal knowledge. However, it is not evident to what extent the external actors are willing to contribute and consequently the private intermediary is seen to have a greater advantage concerning technical knowledge. Similar to the public intermediary, the consultancy firm performs a benchmarking and sometimes involves the end customer in the planning phase. As the consultancy firm incorporates detailed descriptions of technical specifications already in the planning phase, it is more limited in its process than the public intermediary.

**Scanning and Information Processing**

Due to the public and private preconditions, there is an evident difference between the two intermediaries concerning the function of scanning and information processing. Since the public intermediary is obliged to be impartial in the selection of external actors, it never provides the function of defining suitable actors to the small firms’ projects, nor selects them.

When being in need of a specific competence, not provided by the intermediary itself, the consultancy firm searches for potential candidates within its database of external actors. In the planning phase, external actors such as specialists or senior business partners can be selected and involved at the end of the feasibility study. The private intermediary takes in to account
which actor will be best suited for a specific project, for example if the small firm lacks funding, the intermediary might tie the local university to the project since it requires low compensation for its contributions. Thereby, the function provided by the private intermediary is consistent with the scanning and information processing (Howells, 2006), where suitable partners are defined and selected.

**Commercialization**

As the public intermediary addresses market-related aspects and customer needs when giving the small firm homework, it encourages the small firm to create a market research of its own. This particular function draws parallels to the function of commercialization (Howells, 2006), where market-related activities are included.

The function of commercialization also lies within the services provided by the private intermediary. However, given the fact that the function is only provided when the small firm requests an analysis of the market opportunities, it is not considered standard for the private intermediary. If requested, the private intermediary involves the competence from external actors such as market and trend analysts. Thus, it is not within the internal competence of the consultancy firm. The involvement of end customers is initiated in the planning phase, and as this type of actor contributes with market insights, this emphasizes the commercialization function (Howells, 2006). A difference between the two intermediaries is that the consultancy firm extends the function to also include the aid of finding suitable financiers in the planning phase.

**Knowledge Processing and Combination/Recombination**

The private intermediary is characterized by a profound knowledge in product development, and as the planning phase of the consultancy firm includes the specification of technical details, the private intermediary provides the function of knowledge processing and combination/recombination (Howells, 2006). The internal competence that is used during the planning phase contributes throughout the NPD process, implying that the function is a part of the private intermediary’s standard functions. Since the public intermediary is neither helping to combine the knowledge of external actors, nor contributing with internal knowledge of technical development, the function of knowledge processing and combination/recombination is not provided in this phase.

In Table 2, a summary of the intermediation functions provided by the intermediaries in the planning phase is presented. In this phase, neither scanning and information processing nor knowledge processing and combination/recombination is provided by the public intermediary. Furthermore, there are differences to whether the commercialization function is provided internally or externally.
Table 2: A summary of the intermediation functions provided in the planning phase.

<table>
<thead>
<tr>
<th>Function</th>
<th>Intermediary</th>
<th>Internal function</th>
<th>External function</th>
<th>Does not provide the function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foresight and diagnostics</td>
<td>Public</td>
<td>X</td>
<td>X</td>
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<tr>
<td></td>
<td>Private</td>
<td>X</td>
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<tr>
<td>Scanning and information processing</td>
<td>Public</td>
<td>X</td>
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<td>Private</td>
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<tr>
<td>Commercialization</td>
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<td></td>
<td>Private</td>
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<tr>
<td>Knowledge processing and combination/recombination</td>
<td>Public</td>
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<td></td>
<td>Private</td>
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</tbody>
</table>

5.2.2 Concept Development

Below, the intermediation functions identified during the concept development phase are presented and analyzed.

Knowledge Processing and Combination/Recombination

Being mostly reliant on the internal competences as well as the small firm in the previous phase, the public intermediary advances its functions in the concept development phase, including external actors to a greater extent. Acting as financier of the small firms’ projects, the funding allows the small firms to contact external actors to contribute with knowledge to assess the newness, feasibility and market potential of the projects. As the public intermediary is constrained by its public preconditions, not allowing it to select suitable partners, it is the small firm that chooses the external actors and the intermediation function merely lies in helping to merge the new knowledge into the project. As the function of knowledge processing and combination/recombination not only refers to internal competence, but to aiding the knowledge transfer of two or more parties (Howells, 2006), it is a function provided by the public intermediary. Having a moderate understanding of the technical development, that is required to transform an idea into a physical product, differentiates the public intermediary from the consultancy firm and is a limitation to the support it can provide the small firm.

In the private intermediary’s NPD process, the concept development has the purpose of refining the concept from the planning phase. When involving external actors, such as an industrial designer, the consultancy firm helps combine the actor’s knowledge with the project at hand, providing the function of knowledge processing and combination/recombination (Howells, 2006).

Intellectual Property

As both intermediaries implement patent analyses in the concept development phase, they both provide the function of intellectual property (Howells, 2006). The public intermediary encourages the small firm to investigate the newness of its idea by buying reports from patent engineers and assess the possibilities for filing an own patent. This shows great similarities to
the function of the private intermediary, which also involves patent engineers in order to map competing patents. However, since there are differences regarding how far the projects have been specified in the two intermediaries’ NPD processes, the function cannot be considered equal.

In both cases, the aid from patent engineers is limited to advising the small firm on its own IP. A suggestion would be for the intermediaries to actively pair projects together or keep a close look at the market for potential innovations that could benefit the small firm.

**Commercialization**

When buying reports to evaluate if the project is newsworthy or not, the public intermediary incorporates trend analysts. This implies the public intermediary contributing with the function of commercialization (Howells, 2006), as the market is further investigated. The public intermediary also researches the statistics on sales by contacting trade organizations, which further extends the commercialization function. The fact that the public intermediary provides financial means to the small firms’ projects separates it from the consultancy firm. In the concept development phase, the internal funding is provided to purchase the previously mentioned reports in order to assess the small firm’s idea. Having a strong business and financial focus, the core competence of the public intermediary lies in supporting the small firm in finding capital for its projects. Furthermore, the public intermediary attends to the subject of distribution channels, although these external actors are not involved until later in the NPD process.

While the public intermediary provides an extensive commercialization function in the concept development phase, the private intermediary take on a more moderate role. Internal funding of the projects does not lie within the consultancy firm’s boundaries. Instead, the focus lies on market positioning and analysis of potential customers. As for the public intermediary, the distribution channels are merely discussed upon and these external actors are incorporated later in the NPD process.

**Testing, Validation and Training**

Both intermediaries include the competence of testing engineers during the concept development phase. However, there are differences to whether the function is provided from within the company or not. The private intermediary consults its own testing engineers in order to specify the requirements of the product being produced, implying that the function is provided internally. The public intermediary incorporates the knowledge by purchasing reports in the specific area, thereby providing the function externally.

**Scanning and Information Processing**

The function of scanning and information processing is provided by the private intermediary also in the concept development phase, when finding potential collaborative partners from its database of external actors. As mentioned earlier, the public intermediary cannot provide this function as it is limited by its public preconditions.
Gatekeeping and Brokering

The private intermediary contracts each external actor that is tied to the small firm’s project. Thereby, the consultancy firm provides the function of gatekeeping and brokering (Howells, 2006), which includes facilitating negotiations and dealing with external partners. The public intermediary is not allowed to be actively involved in the selection of external actors, as mentioned earlier, which also implies that the function of gatekeeping and brokering is not provided.

In Table 3, a summary of the intermediation functions provided by the intermediaries in the concept development phase is presented. In this phase, the public intermediary provides the commercialization function both internally and externally, while the private intermediary solely offers this function externally. Furthermore, scanning and information processing as well as gatekeeping and brokering are only provided by the private intermediary. Finally, the function of testing, validation and training differs regarding internal and external provision.

Table 3: A summary of the intermediation functions provided in the concept development phase.

<table>
<thead>
<tr>
<th>Function</th>
<th>Intermediary</th>
<th>Internal function</th>
<th>External function</th>
<th>Does not provide the function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge processing and combination/recombination</td>
<td>Public</td>
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<td></td>
<td>Private</td>
<td>X</td>
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<tr>
<td>Intellectual property</td>
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<td>Private</td>
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<tr>
<td>Commercialization</td>
<td>Public</td>
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<td></td>
<td>Private</td>
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<tr>
<td>Testing, validation and training</td>
<td>Public</td>
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<td></td>
<td>Private</td>
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<tr>
<td>Scanning and information processing</td>
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<tr>
<td>Gatekeeping and brokering</td>
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<td>Private</td>
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</table>

5.2.3 System-level Design and Detail Design

Below, the intermediation functions identified during the system-level design and detail design phase are presented and analyzed.

Knowledge Processing and Combination/Recombination

The public intermediary distances itself from the product design, mostly outsourcing this task to external actors. Nevertheless, it is still helping in combining the knowledge of the external partners, providing the function noted as ‘combinatorial’ by Howells (2006). As the public intermediary is not providing any relevant internal knowledge or in-house research, it is prevented from engaging in generation and recombination of knowledge. The private intermediary, on the other hand, can offer a more advanced combinatorial function when
connecting different production partners to the project, as it can also involve in-house research and technologies. Since internal as well as external sources are merged, the private intermediary provides the function of knowledge combination and recombination.

When giving advice on production partners to the small firms, it is natural for the private intermediary to recommend its own partners. Furthermore, the intermediary promotes the production facility of the sister company, trying to keep as much work as possible inside the own concern. Since the private intermediary feels obliged to choose the sister company at first hand and established partners in second, it risks being biased when recommending partners to its customers. Similarly, it can be difficult for the consultancy firm to approach the question of ‘make or buy’ with full objectivity.

In rare cases, the private intermediary even collaborates with a competing consultancy firm during this phase, resulting in the two firms being able to complement each other’s expertise and take on larger projects together, using the combined knowledge. This type of collaboration is recommended by Tether (2002), claiming that it is a profitable arrangement for both parties. However, when asked to further describe the collaboration with the competing consultancy firm, the Area Manager is rather reluctant to further elaborate on the subject. A possible explanation is that competitors are easily regarded as suspicious partners (Tether, 2002), and hence it is probable that the intermediary believes that they are not suitable for collaboration.

Even though the public intermediary cannot offer an equally multifaceted function as the private intermediary, the extent of its engagement still varies depending on the nature of the project. For example, the public intermediary has a closer connection to the development of a service than to the development of a physical product, as the service is not equally reliant on external actors, such as production facilities. When searching for external actors, the many years of experience of taking ideas to market has given the public intermediary the ability to predict suppliers suitable for a certain project. Although, as technical development lies outside the public intermediary’s expertise, the actors involved in manufacturing the product are merely referred to as technical developers or manufacturers. By doing so, the public intermediary inhibits the small firm from understanding the actual manufacturing process and how a product is rightfully produced. This might also be a reason for the low level of learning that has been acknowledged within the public intermediary, resulting in its customers needing the intermediary’s support to be repeated when starting a new project.

**Testing, Validation and Training**

The knowledge entering the project in this phase is mainly centered on production. The involvement of production facilities implies that the public intermediary as well as the private intermediary will provide prototyping, classified by Howells (2006) under the function of testing, validation and training. As the phase of system-level design and detail design aims to refine the concept, regular prototypes are crucial. Even though the function is present in the offer of both intermediaries, only the private intermediary can provide prototyping as an internal function.
**Commercialization**

While the private intermediary focuses on the construction and production during the phase of system-level design and detail design, the public intermediary has its mind set on making the concept presentable to the market. Providing the function of developing a business plan, the public intermediary’s internal business coaches get involved in this stage and are contributing until market launch. Furthermore, the public intermediary offers a multifaceted commercialization function in this phase, including every function mentioned by Howells (2006). By involving sales personnel, accountants and distributors in this relatively early phase, the public intermediary has the possibility to adapt the concept to better fit the selected distribution channels and hence can facilitate the approaching market launch. When analyzing this specific phase, the overall focuses of the two different intermediaries are reflected. While the public intermediary has a strict business focus and a limited understanding of the product development, the private intermediary has the opposite perspective, prioritizing the technology development before the market aspect. Comparing the functions, it becomes obvious that both intermediaries are in need of external actors to supplement their internal knowledge.

In Table 4, a summary of the intermediation functions provided by the intermediaries in the system-level design and detail design phase is presented. In this phase, it is evident that the public intermediary has a strong commercialization function, while the private intermediary prioritizes testing, validation and training.

**Table 4:** A summary of the intermediation functions provided in the system-level design and detail design phase.

<table>
<thead>
<tr>
<th>Function</th>
<th>Intermediary</th>
<th>Internal function</th>
<th>External function</th>
<th>Does not provide the function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge processing and combination/recombination</td>
<td>Public</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing, validation and training</td>
<td>Public</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercialization</td>
<td>Public</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

**5.2.4 Testing and Refinement**

Below, the intermediation functions identified during the testing and refinement phase are presented and analyzed.

**Testing, Validation and Training**

The phase of testing and refinement is not described in detail by the public intermediary, merely implying that these activities are handled by an external production facility. The Innovation Advisor emphasizes the need for postponing the prototyping to the later stages of the NPD process. This opinion is not shared with the private intermediary, rather wanting to plan its prototypes in advance. Obviously, the private intermediary starts its prototyping
earlier than the public intermediary. Consequently, the private intermediary’s function in the testing and refinement phase is centered on testing the already developed prototypes. However, the testing of prototypes often results in iterations within the new product development process, implying loops back to the concept development phase. In this instance, the private intermediary’s capability to keep both an internal R&D department and an internal production facility can facilitate the iterations. An internal function implies a greater flexibility as less administrative work is needed.

**Accreditation and Standards**

Howells’ (2006) description of the function of accreditation and standards is hard to relate to a real-life project. He states that the function is first and foremost applicable to intermediaries originating from government laboratories. This is not the case for either one of the intermediary firms studied in this thesis. However, the private intermediary stresses the need for certification bodies, mainly involved for setting standards. These certification bodies usually originate from government laboratories and organizations. Hence, this function is perceived as being externally provided by the private intermediary, connecting external certification bodies to the project. During the testing and refinement phase, the certification bodies act as validators of the performed tests. To the small firm, this function can constitute a sense of security, knowing prior to the official termination of the concept development that the product will pass the tests for obtaining the certifications needed for launching. Furthermore, it is possible that also the public intermediary provides a similar service, also connecting certification bodies. However, this is not described by the Innovation Advisor, indicating that the public intermediary’s knowledge and interest in the testing procedure is lacking.

In Table 5, a summary of the intermediation functions provided by the intermediaries in the testing and refinement phase is presented. In this phase, the function of testing, validation and training is provided both internally and externally by the private intermediary, while the public intermediary is only providing it externally. Furthermore, the function of accreditations and standards is solely offered by the private intermediary.

**Table 5: A summary of the intermediation functions provided in the testing and refinement phase.**

<table>
<thead>
<tr>
<th>Function</th>
<th>Intermediary</th>
<th>Internal function</th>
<th>External function</th>
<th>Does not provide the function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing, validation and training</td>
<td>Public</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accreditation and standards</td>
<td>Public</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Private</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

**5.2.5 Production Ramp-up**

Below, the intermediation functions identified during the production ramp-up phase are presented and analyzed.
Testing, Validation and Training

In the production ramp-up phase, the private intermediary continues to center on the production aspect, while the public intermediary has its mind set on market launch. Here, the private intermediary produces the first batch, using the same manufacturing processes as for mass production. Howells (2006) refers to this function as the production scale-up, crucial for detecting if the manufacturing processes perform within the set tolerances. Similar to previous phases, the private intermediary emphasizes the importance of this function, while the public intermediary does not mention it. Most likely the external actors, appointed by the public intermediary, also let the prototyping progress into a first batch. However, as the Innovation Advisor is not knowledgeable in the area, the small firm is not provided any insight in this part of the production ramp-up. Hence, the function is regarded as absent from the public intermediary’s offer. The private intermediary, on the other hand, provides this function both through the internal production facility and by external production partners and suppliers.

Commercialization

As the production ramp-up is the last phase, it is no surprise that the commercialization function becomes more apparent for both intermediaries. The public intermediary provides this function through further business development and a strict focus on business deals. Whether the product will reach the point of break-even or not is central for the public intermediary, and it is obvious that this is an important factor when evaluating a project’s success. However, the Innovation Advisor emphasizes that the small firm often underestimates the harsh competition on the market. Here, an important component of the public intermediary’s function is to help the small firm understand the challenges of positioning a new product on the market. As the public intermediary provides counseling within both business and innovation, this part of the commercialization function is regarded as internal in this phase.

The private intermediary is to a greater extent dependent on external actors, exemplified by the increasing responsibility of the distributors and logistics partners in this phase. Although the private intermediary also offers internal support, as it sometimes markets the small firm’s product on the own web site, through social medias or by a press release. As this serves as marketing for the private intermediary, while giving the small firm publicity, an internal marketing function is noted. The private intermediary can also offer an extended support to small firms by acting as a guarantor in agreements, facilitating the small firm’s entry on the market. As the public intermediary is regulated by policies, it has to remain objective and can consequently not offer the same function. Instead, the public intermediary can help the small firm finding external financing, such as venture capital. Besides the funding, a venture capitalist can also serve the small firm with credibility in procurements, fulfilling the same function as the private intermediary.
Assessment and Evaluation
During the production ramp-up, the collaboration between the intermediaries and the small firms ends. The public intermediary offers a function of assessment and evaluation as it monitors the terminated projects and does regular follow-ups. Being aware of the success of previous projects, the public intermediary can assess its own achievement and hence has the opportunity to incorporate continuous improvements. In addition, as the monitoring requires continuous analyses of the market, this function also results in an assessment of the technology development. Having much in common with the function of foresight and diagnostics, this confirms Howells’ (2006) thoughts of the assessment function also being a potential starting point for collaboration.

Even though the private intermediary is also providing a function of assessment and evaluation, its approach differs from the public intermediary. Instead of analyzing the market and monitoring the outcome of the project, the private intermediary lets the small firm evaluate the project and suggest improvements. The private intermediary also emphasizes the importance of the project being correctly documented, as this permits tracing of the decisions affecting the outcome of the project. To summarize, the public intermediary has a macro perspective in this final stage of the new product development process, evaluating the specific project based on its position on the market. The private intermediary, on the other hand, has a more narrow perspective, evaluating the opinions of individuals on a micro level.

Currently, the assessment and evaluation function is strictly separated from the other functions in the production ramp-up phase. By evaluating the project after it is terminated, the opportunity to improve the collaboration during the project is reduced.

In Table 6, a summary of the intermediation functions provided by the intermediaries in the production ramp-up phase is presented. In the last phase, the sole difference between the two intermediaries is the private intermediary’s provision of testing, validation and training, which is lacking from the public intermediary’s offer.

Table 6: A summary of the intermediation functions provided in the production ramp-up phase.
6 Discussion

The discussion is initiated by addressing the role of the intermediary from a general viewpoint, followed by a closer look on the intermediation functions provided by the two intermediaries and the functions’ connection to the phases of the generalized NPD process. Finally, the discussion diverges to incorporate the public and private preconditions.

6.1 The Role of the Intermediary

The public intermediary acts as a policy maker (Bakici et al., 2013), seeking to increase the number of successful inventions brought to the market, in order to strengthen the Swedish industry. Hence, its main tasks are to act as a support in the creation of the business organization, advise the process of choosing external help and aid the project throughout the NPD process. The private intermediary, on the other hand, is a technology-based consultancy firm, active as an intermediary in supporting small firms. According to Bessant and Rush (1995), private intermediaries often operate as consultancy firms, especially within the technology field. In general, the role of the consultancy firm is expanding to include long-term partnerships with customers (Bessant and Rush, 1995), and hence making the boundary between the intermediating function and the consulting function fuzzy. It is probable that the private company still defines itself as a consultancy firm rather than an intermediary, but most likely the self-image is transforming towards a more extended role. However, as Howells (2006) concludes, it is always difficult to classify a company solely as an intermediary, as it usually has internal functions and competences that are not necessarily correlated to the intermediating function.

The differing operating areas of the two intermediaries clearly affect their functions provided internally. As the analysis in this thesis illustrates, the public intermediary centers on the commercialization function, while the private intermediary is technology focused and rather emphasizes the functions related to production, e.g. the function of testing, validation and training. The private intermediary further differs from the public intermediary by being strictly reliant on the gates incorporated in the NPD process. Since the private intermediary is a consultancy firm, it needs to estimate the future prototypes required as well as the costs for each phase. These premises limit the creativity and usually result in a concept being selected too early in the process. It is important that every actor involved in the project understands the objective of the process, but it is probably better to start with a clearly defined customer need than a defined technical solution. This is in line with the changing conditions of the industry, transforming the market to be customer-driven instead of technology-driven (Von Hippel, 2005).

Even though the technology focus of the private intermediary can be a constraint, it should also be perceived as an inspiration to the public intermediary, currently not at all explaining the production-related functions to the small firm. Both intermediaries could learn from each other, the private intermediary by implementing a stronger commercialization function and the public intermediary by learning more about the actual product development. In order to
secure a broad expertise within each intermediary’s organization, the need for a database of external actors is obvious. The public intermediary is already heading in this direction, as areas that lie beyond its core expertise are addressed to external actors. In this sense, the public intermediary is open to the involvement of external competence and has a general acceptance that the development cannot fully be performed in-house. Furthermore, as the public intermediary lacks the resources to manufacture the inventions that are brought to the company, thus increases the importance of external production facilities and specialists. It is noticeable that the public intermediary is well aware of its own strengths and weaknesses and hence has no problem connecting external competence to the fields where the own competence is lacking. Although regarding the private intermediary, its role as a consultancy firm motivates the effort of trying to manage as many different functions as possible. Hence, the private intermediary is mostly interested in incorporating external competence in its own organization, still trying to keep as much as possible of the actual product development in-house. Even though the private intermediary has a diverse internal competence, it is sometimes better to accept that an external actor can do the task more efficiently. This is clearly applicable to the private intermediary’ commercialization function, as it is neglected in most phases of the NPD process.

Throughout the NPD process, the private intermediary act as a sounding board, providing advice to the small firm and managing the contact with the external actors. Using Howells’ (2006) own terms to define this collaboration, the private intermediary mostly operates ‘one-to-one-to-many’, linking the small firm to the database of external actors. However, the private intermediary also provides certain functions, mostly regarding R&D, on a ‘one-to-one’ basis, using its internal expertise. When operating ‘one-to-one-to-many’, the small firm can feel secure, knowing that the private intermediary recommends external actors that it already has established partnerships with. Only needing to maintain the relationship with the intermediary, the process of involving several actors is considerably facilitated for the small firm and becomes an incitement for selecting the private intermediary as a supporting partner.

The public intermediary’s operations are also most similar to the ‘one-to-one-to-many’ constellation, although the intermediary suffers from constraints due to its commitment to the Swedish government. The public intermediary should keep its objectiveness and is consequently not allowed to recommend external actors to the small firm. For the purpose of facilitating the projects for the small and inexperienced firm, it is not unusual that the public company points towards the partners it recommends. Although, it lies in the small firm’s responsibility to contact them, leaving the public intermediary in-between the small firm and the external actors, without having the permission to actively manage the partnerships. The private intermediary, on the other hand, is allowed to maintain all relations with the external actors, simplifying the process for its customers, who do not need to initiate contact themselves. Since the consultancy firm is more established than the average small firm needing support, the offer can also involve letting the small firm use the company name as a reference. Most likely giving the small firm an advantage in procurements and negotiations, the use of the intermediary’s name and brand can be beneficial. However, in order to keep the
brand trustworthy, it is important that the intermediary only lends its name to high quality projects.

### 6.2 The Intermediation Functions

Howells (2006) describes the role of the intermediary as multifaceted, engaging in the NPD process with an increasingly holistic perspective. However, his ten intermediation functions, defined during the innovation process, are presented as separate events, not correlated to each other. As Howells’ (2006) holistic perspective is absent from his defined functions, a supplementary long-term function could be proposed. Since this thesis has defined the provision of an established NPD process as a crucial component in the intermediary’s support, the NPD process could be regarded as a potential long-term function. As the knowledge of how to apply the NPD process to a project lies in the role of the intermediary, this expertise should be acknowledged as part of the intermediation function. The function of an established NPD process is applicable to every phase in the project, illustrating that the intermediary consistently supports the small firm, while also linking Howells’ (2006) ten separate functions together. By adding this general function to the model, a more holistic perspective is obtained.

When analyzing the functions of the two diverse intermediaries, nine out of Howells’ (2006) ten functions are identified. Only the function of regulation and arbitration is absent, strengthening Howells’ (2006) notion on this function being less frequent than the others. However, Howells (2006) never claims that a company has to provide a complete set of functions to be regarded as an intermediary. The functions are merely a synthesis of possible functions offered by different kinds of intermediaries. As already mentioned, the need for a complementing function, accentuating the value of an established NPD process is noted. In addition, a supplementing management function could be suggested, as it lies in the nature of the intermediary to organize the NPD process as well as the external actors. The need for a management function is also accentuated by Lee et al. (2010), describing network management as a direct support. Although, it is evident that different kinds of intermediaries have varying opinions on how to efficiently manage the project. In the cases investigated in this thesis, the public intermediary claims that it is important that the project leader comes from within the small firm, while the private intermediary wants to lead the project itself. Consequently, the intermediary’s management function could be regarded as either managing the project itself or coaching the small firm to lead the project.

The need for modifications has been noted for several functions. As the role of the intermediary is complex, it is hard to strictly define which functions are provided. For example, the private intermediary clearly offers the function of scanning and information processing, as it helps the small firm to process information and select external actors suitable for collaboration. The public intermediary, on the other hand, assists the small firm with information processing but is not allowed to officially select the collaboration partners. However, it is apparent that the public intermediary still hints which external actors could be suitable for the small firm. Here, the need for an explanation of how and to which extent a specific function is offered is evident. Hence, an indication of the intensity of each function is
an appropriate complement to Howells’ (2006) model. In this instance, the framework of the public intermediary’s role (Lee et al., 2010) could be used as an inspiration, as it emphasizes the difference between direct and indirect support. By categorizing Howells’ (2006) functions as directly or indirectly provided, the illustration of the intermediary’s functions would be more accurate.

6.3 The Intermediation Functions in the NPD Process

As mentioned in the theoretical framework, Howells (2006) acknowledges two approaches for investigating the roles of the intermediary: either keeping a focus on the intermediary as an organization or on the intermediation as a process. As the thesis addresses the latter, keeping a process perspective throughout the study, Howells’ (2006) ten intermediation functions are applied to the two investigated intermediary companies. Analyzing the services of the two intermediaries based on these functions, it is shown that several functions appear in more than just one of the phases in the two intermediaries’ NPD processes. However, in the definition, Howells (2006) applies a linear view of the innovation process, implying a sequence from initial research to commercialization. Consequently, by applying the intermediation functions to the different phases of a NPD process, a new dimension is added to the investigation of the intermediary’s functions – iterations can be acknowledged. For example, the commercialization function is provided by the public intermediary in five out of six phases in the NPD process and in three out of six for the private intermediary.

Furthermore, Howells’ (2006) intermediation functions are presented according to a sequential order, compatible with the linear view of the innovation process. From the analysis, it is shown that this chronological order is in fact not applicable on the two cases studied in the thesis. The example mentioned in the previous paragraph can also be used in order to verify this aspect, as the function of commercialization is introduced at the end of Howells’ (2006) list, although appears already in the first phase of the two intermediaries’ NPD processes. This correlates to the analysis showing an early involvement of end customers in the NPD process, which is in line with Von Hippel’s (2005) reflection that the industry is increasing its adaptation to customer needs.

The application of Howells’ (2006) intermediation functions to the phases of a generalized NPD process thereby extends the current view of the intermediary to include iterations. This is an aspect, which has not yet been brought to attention in prior research.

6.4 The Generalized NPD Process

Focusing the discussion on the generalized NPD process, the results from the analysis prove its applicability on the two cases. The process is a synthesis of current NPD models, developed to facilitate the analysis and application of the intermediation functions, hence increasing the comparability of the cases. Although investigating two different types of intermediaries, applying the phases from Ulrich and Eppinger’s (2008) activity-stage model works well in both cases. Not only do the intermediaries differ in regards to public or private preconditions, there is a great difference to their core focuses, one providing business
coaching and the other technical development services. However, as both intermediaries follow an innovation process, the activities still correlate. What can be seen in the analysis and that corresponds to Ulrich and Eppinger’s (2008) definition, is an evident market focus throughout both of the NPD processes. In both cases, system-level design and detail design could be merged into a joint description, as the activities were hard to separate between the two.

Furthermore, gates are apparent in both intermediaries’ processes, hence it is a suitable complement to the activity-stages of Ulrich and Eppinger (2008) in the generalized NPD process. In the public intermediary’s process, the small firm performs the requirements of the gates while the intermediary makes the decision, which is similar to Cooper and Edgett’s (2006) approach of having the senior management involved in the decision-making. The private intermediary, on the other hand, performs the necessities for each gate and let the small firm make the decision. This can be explained by the fact that the consultancy firm is being paid by the small firm, resulting in the small firm acting as a buyer and thereby is the ultimate decision-maker.

In this thesis, the external inputs that are seen in Trott’s (2012) network model correspond to the external actors in the intermediary’s database. As external actors are incorporated to a great extent in both the private and the public intermediary’s development processes, this attribute is not uncalled for in the generalized NPD process. As the extent of actor involvement varies in the phases of both intermediaries’ processes, there is a strong correlation to Trott’s (2012) concept of knowledge accumulation along the NPD process. For example, distributors are involved in the concept development phase in both intermediaries’ processes, although take on a more substantial role later in the phases of system-level design and detail design and production ramp-up.

When designing the collaborative network for each project, the intermediary needs to address both the search breadth and search depth (Laursen and Salter, 2006). As highlighted by Lee et al. (2010), incorporating too many actors could be destructive. However, the actors are present for different durations, as some take part in the entire process and others only engage in a small part of a certain phase. Reflecting on Trott’s (2012) network model in combination with Van de Ven’s (1986) opinion that the goal is to find a constellation that adds up to more that just the sum of its parts, the knowledge from several actors during the entire project can contribute to a better foundation for making decisions.

By implementing Howells’ (2006) intermediation functions in a theoretical NPD process, which correlates to the processes of both of the investigated intermediaries, a new perspective on the role of intermediary can be obtained. As the generalized NPD process can be applied to two completely different cases, the process is validated as a foundation for the analysis.
6.5 The Public and Private Preconditions

The public and private preconditions constitute a core differentiator between the two intermediaries studied in the thesis. Reflecting on the results of the analysis, the public intermediary has an even distribution of functions provided internally and externally. The private intermediary, on the other hand, has a slightly higher rate of functions provided internally. This emphasizes the fact that the consultancy firm’s economical gains, connected to the collaboration with the small firm, affects its tendency to keep most of the services in-house.

The preconditions of the public intermediary obligate it to contribute to the mission of strengthening Swedish industry. The focus on economical aspects and funding is evident, emphasizing the function of commercialization as the intermediary’s top priority. The result of the analysis is thereby strongly connected to the specific public mission, and not to be equated with the focus of all public intermediaries. Evidently, all public companies do not serve the same purpose.

The public and private preconditions in the two cases indicate a difference to the overall perspective. While the public intermediary keeps a more holistic and long-term view of the process, a macro perspective, the private intermediary is more focused on the short-term gains, a micro perspective. The consultancy firm is limited by the obligation of specifying each step in the NPD process in detail and also the necessity to make a profit in order to survive.

Although there are similarities to the functions provided by the two intermediaries, the public intermediary has an objectivity that could never be provided by the consultancy firm. Small firms are often careful when it comes to incorporating external actors, since they want to protect their intellectual property (Narula, 2004). The safety that the public intermediary offers the small firms makes them less prone to protect their inventions and the possibilities of long-term relationships increase. Since the private intermediary values its own success above the small firm’s, the same objectivity cannot be achieved.
Conclusion

This thesis shows that Howells’ (2006) intermediation functions are applicable to the phases of a generalized new product development process. Although the natures of the two intermediaries, investigated in this thesis, are diverse, the generalized NPD process has been proved illustrative in both cases, validating its relevance as a framework in this analysis.

When applying the intermediation functions to the generalized NPD process, it is observed that certain functions occur multiple times in the same project. This phenomenon implies that there are iterations in the NPD process and consequently the process is not to be regarded as strictly linear. As Howells (2006) only presents the functions in the context of a linear innovation process, lacking defined phases, one of this thesis’ main contributions lies in the application of the functions to an iterative NPD process. By linking the functions of two diverse intermediaries to specific phases in the generalized NPD process, the micro perspective allows a deeper understanding of the intermediary’s role.

Keeping the micro perspective, the analysis of the empirical evidence collected in this comparative case study shows that the private intermediary provides the same functions as the public intermediary. The private intermediary investigated in this particular thesis has a strong R&D focus, distinguishing it from the examined public intermediary. However, these differences are regarded as characteristics for these specific firms, irrelevant for comparing the functions of a private and a public intermediary. Furthermore, the private intermediary offers certain functions that the public intermediary cannot compete with. As it lies in the nature of a public company to be impartial, the public intermediary cannot officially help the small firm select external actors for collaboration. This premise inhibits the public intermediary from fully providing the function of scanning and information processing.

In conclusion, the micro perspective study indicates that the private intermediary is capable of providing a more extended assortment of intermediation functions than the public intermediary, while not being reliant on government funding. This result challenges the position of the public intermediary, as it shows that the intermediary function can exist without the support from policies. However, it is too early to jump to conclusions whether or not the public intermediary can offer additional values, differentiating it from the private intermediary. Since small firms usually are protective of their intellectual property, it is possible that non-profit companies can attract customers that would not collaborate with a private actor. The functions presented by Howells (2006) do not consider company characteristics, implying the need for further studies in this area in order to investigate the more abstract attributes of the public intermediary’s support in detail.
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