Assessment Tool of Best Practices for SMEs to Stimulate Incremental and Radical Innovation

Author: Roy Florijn
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT
This research helps to create a better understanding of the concept of innovation by explaining different dimensions that exist and providing examples for every type of innovation. After analyzing the different types of innovation, an innovation pentagon is proposed, which helps both managers and researchers to more effectively categorize different innovations. Radicalness of innovation is chosen as a popular and inclusive dimension of innovation and best practices from previous research to stimulate radical and incremental innovation are described and analyzed, in addition to best practices that stimulate both radical and incremental innovation. The best practices are categorized based on which key process area of innovation they influence and an assessment tool is developed to help managers of SMEs implement effective innovation practices in their organization for the desired type of innovation. The assessment tool uses a maturity model with five levels of sophistication to assess in which maturity stage an SME is located. By using this assessment tool, managers of SMEs can identify problem areas in the innovation process and have easy access to instructions on enhancing innovativeness. Finally, the proposed assessment tool is compared to The Innovation Company's assessment tool and differences and similarities are discussed. What is lacking in either tool is also analyzed, and possible points of improvement are recommended.

1st Supervisor: Dr. Matthias de Visser (University of Twente)
2nd Supervisor: Dr. Michel Ehrenhard (University of Twente)

Keywords
innovation, radical innovation, incremental innovation, types of innovation, best practices, maturity model, assessment tool

9th IBA Bachelor Thesis Conference, July 5th, 2017, Enschede, The Netherlands.

1. INTRODUCTION

A positive relationship exists between innovativeness and organizational performance (Frambach & Schillewaert, 2002; Jiménez-Jiménez & Sanz-Valle, 2011; Hult, Hurley & Knight, 2004). Although the importance of innovation for organizational performance has been established, still 37% of firms do not engage in innovation activities and of those firms that do engage, 55% do not introduce new products or services (Department for Business Innovation and Skills, 2004). It appeared that most of the firms struggling with innovation were small and medium-sized enterprises (SMEs). Researchers have included several reasons why SMEs typically struggle with innovating, such as high costs of innovation and high economic risk, bureaucratic hurdles (Acs & Audretsch, 1990), and difficulties in finding and maintaining qualified personnel (Ylinenpää, 1998).

Research about best practices for stimulating innovation has already been conducted. However, findings often include general instructions, such as *"install a strategic, long-term orientation toward NPD"* or *"conduct market research proactively"* (Kahn et al., 2006, p.114). Such instructions lack clear specifications of what a manager of an SME needs to do to enhance innovativeness. Next to that, different types of innovation exist and best practices are different for each type of innovation (Ettlie et al., 1984), making the matter only more complicated.

The goal of this research is to provide managers of SMEs with an understanding of the types of innovation that exist and a tool to assess and improve their organization's innovation process. It is important that best practices are described on an operational level, since that provides greater value for managers of SMEs.

The focus of this research specifically on SMEs is due to the collaboration with *The Innovation Company*. The Innovation Company is a Dutch innovation consultancy agency and mainly has technology-focused SMEs and start-ups in their client portfolio. The outcomes of this research can be applied directly to their customers to help them enhance their innovativeness. The name *The Innovation Company* is not the real name of the organization, but is used to ensure the organization's privacy.

2. RESEARCH QUESTION

The previous section highlighted the need for SMEs to enhance their innovativeness and the problems that SMEs encounter in their attempts to improve. Considering the problems SMEs have to innovate, there is a need for a comprehensive framework that helps SMEs to manage the innovation process more effectively. The goal of this research is to provide a typology of innovation and develop the aforementioned framework. This research goal leads to the following research question:

How can SMEs effectively assess and improve their innovation process?

In order to answer the research question satisfactorily, the following sub-questions have been constructed:

a. *Which types of innovation exist and how do they differ?*
b. *Which best practices exist for the innovation process of SMEs?*
c. *How can the innovation process of SMEs be assessed?*

Answering sub-question c will lead to the development of an innovation assessment tool. The Innovation Company is currently applying their own diagnostic tool to customers, called the *The Innovation Company Innovation Performance Ladder* (The Innovation Company, 2017). Therefore, the final part of the research will focus on answering the last sub-question:

d. *How does the proposed assessment tool compare to The Innovation Company's Innovation Assessment?*

3. METHODOLOGY

This research can be considered a secondary research, as information provided by others in current literature is reviewed, analyzed and synthesized (Stewart & Kamins, 1993). The type of research that was conducted is a literature review. Fink (1998) defines a literature review as *"a systematic, explicit, and reproducible design for identifying, evaluating, and interpreting the existing body of recorded documents"* (p. 3). Seuring and Müller (2008) identify two general goals of literature reviews: *"first, they summarize existing research by identyfing patterns, themes and issues. Second, this helps to identify the conceptual content of the field and can contribute to theory development"* (p. 1700).

First, sources were found by entering search terms in academic search engines such as Web of Science, Scopus and Google Scholar. Examples of search terms are "types of innovation", "innovation dimension", "innovation" and "measuring innovation".

The available sources were scanned for relevance first, then the relevant sources were organized by which sub-question they could possibly help answer. Answering the first sub-question was done through analyzing the literature on innovation typologies and synthesizing the most popular and valid dimensions found in literature. The second sub-question was answered similarly, however, now the literature that was used had the theme of best practices for innovation. To access this literature, keywords such as "best practices" and "predictors" were added to the previously mentioned search terms. They were reviewed based on which dimension is used for best practices and their findings' relevance for SMEs.

For this research, a best practice for innovation was defined as an organizational process or activity that optimizes innovativeness. A best practice can also be understood as a success factor or determinant of innovation. The best practices that were included in this research were based on their applicability for SMEs. Best practices studies were collected and judged on their applicability for SMEs; if the findings were very broad and irrelevant for SMEs, they were not included in the research.

The third question was answered by reviewing how the identified best practices could be measured. The measurement should be easy to understand to ensure the usefulness for SMEs. Finally, the last sub-question was answered by reviewing The Innovation Company's assessment tool (The Innovation Company, 2017) and comparing it to this research's findings. Similarities and differences were discussed and analyzed, drawing conclusions on the validity and reliability of both tools.

The outcome of answering the first sub-question resulted in a definition of innovation with different dimensions. The chosen definition of innovation should be an inclusive one, as the goal of this research was to develop a tool that is applicable across industries. Secondly, the dimensions of innovation that were used should have roots in literature and generally be considered valid dimensions. Thirdly, the proposed typology should have the ability to differentiate a great number of innovations based on their characteristics in greater detail than on a dichotomous level. Since innovations can differ in many ways and have many different characteristics, the proposed typology of innovations should consider multiple dimensions. This way, innovations that are significantly different will not be considered equal, because of a lack of dimensions to discriminate upon.

Answering the second and third sub-question resulted in the construction of an assessment tool for innovation. To ensure the accurateness of such a tool, it is necessary to develop requirements for its design. First of all, it is important that the

chosen dimension of innovation is relevant for all SMEs and not only for a select number of organizations. Therefore, a rather broad definition and dimension of innovation should be chosen. Secondly, the best practices described should be relevant and applicable for SMEs and explained in great detail, so managers of SMEs can easily apply the best practices where necessary. Thirdly, the measurement of innovation should also be easily executable for SMEs and areas of improvements should be easily recognizable. The chosen measure was that of a maturity model, which *"present sets of recommended practices in a number of key process areas"* (Paulk et al., 1993, p. 18). Maturity models are *"designed to help (…) select process-improvement strategies by determining their current process maturity and identifying the most critical issues to improving their (…) process"* (Paulk et al., 1993, p. 19).

The developed innovation assessment tool was assessed by comparing it to The Innovation Company's diagnostic tool. Discussing the differences and similarities of the two tools, conclusions were drawn on the relevance of both tools, how they can work together and what is lacking in the tools. This way, both tools' performance can be improved.

Other ways in which this research could be conducted is by taking a more academic focus, rather than a practical one. This research focus especially on developing an overview of innovation types and an assessment tool that is useful for managers and practical in its use. Instead of this practical orientation, a more academic focus could be adapted and existing literature could be reviewed critically to define what innovation exactly is. Such a research could also develop an assessment tool that assesses the innovation process statistically, by researching correlations and associations between factors in the innovation process and organizational performance. Although this is an interesting perspective for future research to take, this research strives to enhance practical relevance for managers of SMEs and therefore, takes a more practically oriented approach.

4. TYPOLOGY OF INNOVATION

4.1 Defining Innovation

The first challenge that arises is to establish a definition of innovation that captures the essence of the construct. Schilling (2013) defines innovation as *"the practical implementation of an idea into a new device or process"* (p. 18), therefore proposing that innovation is related to creativity. Creativity is defined as *"the ability to produce work that is useful and novel"* (Schilling, 2013, p. 19) and can be discussed on individual, as well as organizational level. Thompson (1965) also believes that innovation is closely related to idea generation, and proposes that innovation can be defined as *"the generation, acceptance, and implementation of new ideas, processes, products or services"* (p. 2).

Another definition of innovation is proposed by West & Anderson (1996) and quoted by Wong et al. (2009) as *"the effective application of processes and products new to the organization and designed to benefit it and its stakeholders"* (p. 2). This definition emphasizes the function that innovation should possess, namely its beneficence to an organization and its stakeholders.

On the other hand, Van de Ven (1986) defines an innovation as *"a new idea, which may be a recombination of old ideas, as scheme that challenges the present order, a formula, or a unique approach which is perceived as new by the individuals involved"* (p. 591). He stresses that something can be considered an innovation as long as the idea is perceived as new to the people that are involved, *"even though it may appear to others to be an imitation of something that exists elsewhere"* (Van de Ven, 1986, p. 592). Thus, his definition includes the degree of newness to the people that are involved, implying that something can be both an innovation or an imitation, depending on your own perspective.

Baregheh et al. (2009) recognize the diversity of definitions of innovation and conducted a literature review to find a multidisciplinary definition of innovation. They included around 60 definitions of innovation of various disciplines, and arrived at the following definition: *"Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, services or processes, in order to advance, compete and differentiate themselves successfully in their marketplace"* (p. 1334). This definition includes the findings of previous researches that found that innovation is a multi-stage process, rather than a singular event. Moreover, it utilizes the previously mentioned relevance of the generation of ideas to innovation and finally, the competitive aspect of innovation is also included in this definition. For the remainder of this research, the definition of innovation by Baregheh et al. (2009) will be used.

4.2 Types of Innovation

Schilling (2013) discusses four of the most commonly used dimensions of innovation: product versus process innovation, radical versus incremental innovation, competence enhancing versus competence destroying innovation and finally, architectural versus component innovation.

4.2.1 Product versus Process Innovation

The first dimension that is discussed, product versus process innovation, recognizes two different types of innovation based on "where" an organization innovates. Schilling (2013) mentions that product innovations are *"embodied in the outputs of an organization – its goods and services"* (p. 46), while process innovations are *"innovations in the way an organization conducts its business, such as in the techniques of producing or marketing goods or services"* (p. 46).

This definition implies that product innovation occurs in the outputs of an organization, thus in the products or services an organization develops. Utterback and Abernathy (1975) found that *"a product innovation is a new technology or combination of technologies introduced commercially to meet a user or a market need"* (p. 642), which emphasizes that a product does not necessarily need to consist of new technologies only, a novel combination of existing technologies also allows to be considered a product innovation. The ultimate example of this definition is the introduction of the first iPhone by Apple Inc., in January 2007. Apple's press statement was captioned *"Apple Reinvents the Phone with iPhone"*, suggesting that a revolutionary product innovation had taken place. The first sentence of the press statement was as follows: *"Apple today introduced iPhone, combining three products — a revolutionary mobile phone, a widescreen iPod with touch controls, and a breakthrough Internet communications device with desktop-class email, Web browsing, searching and maps — into one small and lightweight handheld device."* (Apple Press Statement, 2007). The several techniques that were incorporated in the iPhone were not especially new, however, the combination of those techniques was revolutionary and resulted in a phone that made the world a different place (Elgan, 2011; Tibken, 2017; Titcomb, 2017). Another example of a product innovation is LG's roll-up television (Lee, 2016). LG has been teasing customers for years by hinting towards the development of a television that can be rolled up by customers. Recently, LG announced they are working on the production of this television and showed some prototypes. This innovation can be considered a product innovation, because it incorporates a new technology,

namely the roll-up display, into the existing product that is the television.

Process innovation *"combines the adoption of a process view of the business with the innovation to key processes"* (Davenport, 1993, p. 1). Following from Schilling's (2013) definition, process innovation consists of changes in the way how organizations do business, instead of changes in their outputs. This is illustrated by the definition of Papinniemi (1999), who defines process innovation as *"performing a work activity in a radically new way"* (p. 96). A classic example of a process innovation is the introduction of the world's first moving assembly line by Ford in 1913, more than 100 years ago. This process innovation greatly enhanced productivity, by decreasing the time necessary to produce one car from more than 12 hours to less than 3 hours (Ford, 2013). This increase in productivity through a process innovation made cars affordable to the general public, changing the landscape of traffic immensely. Another example of a process innovation is Nike's customization option, called NikeID. NikeID gives customers the opportunity to design their own pair of shoes online, after which Nike manufactures the shoes according to the chosen design and delivers the shoes at home within a few weeks. This online customization process was already available in 1999, which was a revolutionary innovation at the time (Team, 2015). This innovation can be considered a process innovation, since it changes the way products are designed and brought to market. Instead of designing several types of shoes and promoting them to customers, Nike made their production process more flexible and allowed customers to design their own shoes at a premium.

4.2.2 Radical versus Incremental Innovation

Schilling (2013) also introduces the dimension that differentiates between radical and incremental innovation, where the dimension is derived from the degree of radicalness of an innovation. Radicalness is defined as *"the combination of newness and degree of differentness"* (Schilling, 2013, p. 46). Radical innovations are those that are new to the world and different from current products and processes, whereas incremental innovations are not particularly new or different (Schilling, 2013). Dewar and Dutton (1986) define radical innovations as *"fundamental changes that represent revolutionary changes in technology. They represent clear departures from existing practice"* (p. 1422). On the other hand, *"incremental innovations are minor improvements or simple adjustments in current technology"* (Dewar & Dutton, 1986, p. 1423). These definitions all use a perspective where radicalness is measured by looking at the extent of newness and differentness. However, Schilling (2013) proposes that radicalness can also be defined in terms of risk for the organization. This implies that innovations with high costs of development, thus high risk, can also be considered radical innovations, even when they are not especially new or different (Ettlie et al., 1984). Moreover, *"radicalness of an innovation is relative, and may change over time or with respect to different observers"* (Schilling, 2013, p. 47). This means that something that was once considered a radical innovation, may later become more similar to an incremental innovation, because the knowledge supporting the innovation is getting more common. Radicalness is also relative to every firm, since an innovation may seem radical to one firm, but incremental to another firm with different resources and capabilities (Schilling, 2013). Reviewing current literature, the degree of radicalness appears to be related to the extent of newness and differentness, the amount of risk involved and the perspective of the organization at a certain point in time.

Examples of both incremental and radical innovation are easily provided by looking at Apple Inc.'s product portfolio. The same example as mentioned before, the introduction of the first iPhone, is a perfect representation of a radical innovation. The iPhone was the first smartphone and therefore, can be considered to have a high extent of newness. Moreover, it could not be compared to any other phone at that time, so it was very different to existing products too. This results in a high degree of radicalness, and thus makes the innovation very radical. On the other hand, the introduction of the iPhone 6S represents an incremental innovation, as it is not very new or different compared to existing products. It rather builds on the already existing iPhone 6 and adds some minor improvements to that model.

Dyson is another company that is famous for its radical innovations. They are known to *"reimagine the mundane"* (Griffin-Smith, 2016), which means they try to come up with completely new ways of designing everyday product, such as vacuum cleaners and fans. Dyson is famous for prototyping until the perfect vacuum cleaner was designed, taking no less than 15 years and 5127 prototypes before creating the perfect vacuum cleaner (Griffin-Smith, 2016). Dyson managed to redesign the way vacuum cleaners worked and his Dyson vacuum cleaner has since become a famous brand in many households.

Looking at examples of incremental innovation, Gillette can be considered a typical company that seeks to innovate incrementally. Their first razor blades existed out of a single blade, but their products have been evolving continuously and new features were added. They now produce razor blades with several blades and their Flexball technology, which allows the razor to bend with the shape of the customers face. The caption on Gillette website is *"Gillette razor blades combine 100+ years of innovation for a perfect shave"* (Gillette, 2017). This slogan captures the essence of incremental innovation, namely taking a product and improving it with small steps, by fulfilling customer needs a little bit more with every innovation.

4.2.3 Competence-enhancing versus Competence-destroying Innovation

The third dimension of innovation types Schilling (2013) discusses is competence-enhancing versus competence-destroying innovation. This dimension differentiates innovation types based on whether the innovation builds on an organization's competences or not. *"An innovation is considered to be competence-enhancing from the perspective of a particular firm if it builds on the firm's existing knowledge base"* (Schilling, 2013, p. 47). On the other hand, innovations are competence-destroying when *"the technology does not build on the firm's existing competences or renders them obsolete"* (Schilling, 2013, p. 48). As can be concluded from these definitions, this dimension does not restrict itself to one option for each innovation, as a certain innovation may be competence-enhancing for one organization, and competence-destroying for another. Therefore, it can be regarded a valuable dichotomous dimension from an organization's perspective. However, it is less applicable in the context of this research. Examples of competence-enhancing and competence-destroying innovations are provided by Schilling (2013). An example of a competence-enhancing innovation is Intel's microprocessor. Every new generation of Intel's microprocessors *"builds on the technology underlying the previous generation. Thus, while each generation embodies innovation, these innovations leverage Intel's existing competences, making them more valuable"* (Schilling, 2013, p. 48). On the other hand, Keuffel & Esser used to be a firm that was very successful in selling slide-rule makers that were used in engineering from the 1600s until the 1970s. The invention of the handheld calculator, however, proved to be a competence-destroying innovation for Keuffel & Esser, who had no background in electronics. *"Whereas the inexpensive handheld*

calculator built on the existing competences of companies such as Hewlett-Packard and Texas Instruments (and thus for them would be competence-enhancing), for Keuffel & Esser, the calculator was a competence-destroying innovation" (Schilling, 2013, p. 48).

Another example of a competence-destroying innovation is the case of Kodak and its reluctance to transition to digital photography. For years, film-based photography had been the successful business model of Kodak. In 1975, one of Kodak's engineers invented the first camera that used digital photography. Management, however, did not want to transition the business-model towards digital photography, because they knew it destroyed their existing competences, namely that of film-based photography. The reluctance to make this transition made Kodak lag behind competitors in the time when digital photography had its real breakthrough, resulting in Kodak's file for bankruptcy in 2012 (Mui, 2012).

4.2.4 Architectural versus Modular Innovation

The fourth and final dimension as described by Schilling (2013) is architectural versus modular innovation, which differentiates between two types based on whether they affect the overall configuration of a system, or only one or more components. A modular (or component) innovation *"entails changes to one or more components, but does not significantly affect the overall configuration of the system"* (Schilling, 2013, p. 48). When considering the example of a car, a modular innovation to the car would be the design of the new tires, which allows the rest of the design to stay the same, only changing the four tires of the car. *"An architectural innovation entails changing the overall design of the system or the way that components interact with each other"* (Schilling, 2013, p. 48). Using the same example of the car, an architectural innovation would happen when the entire frame of the car would be changed, and therefore all components need to be redesigned and reconfigured, because otherwise they will not work and fit together.

4.2.5 Administrative versus Technical Innovation

Although Schilling (2013) identified 4 dichotomous dimensions of innovation types, those are not all types of innovation that are described in literature. Subramanian and Nilakanta (1996) adopted a so-called "dual core" typology of innovations, differentiating between technical and administrative innovations. *"Administrative innovations are defined as those that occur in the administrative component and affect the social system of an organization. The social system of an organization consists of the organizational members and the relationships among them"* (p. 637). An administrative innovation does not lead to a new product or service, but rather changes something in the administrative part of an organization. An example of an administrative innovation would be the introduction of a new staff development program, which helps an organization to better educate their employees. Another example of an administrative innovation is an innovation from Google in the human resources field. In 2004, Google founders Larry Page and Sergey Brin explained their innovation in a letter: *"Google employees have "20 percent time" – effectively one day per week – in which they are free to pursue projects they are passionate about and think will benefit Google. The results of this creative effort already include products such as Google News, Google Suggest, and Orkut – products which might otherwise have taken another start-up company to create and launch"* (Alphabet Investor Relations, 2004). This innovation can be considered an administrative one, since it changes the way employees do their jobs. Therefore, it also affects the members of the organization, thus allowing for it to be considered an administrative innovation.

Technical innovations are innovation that occur in the technical system of an organization. *"The technical system consists of the equipment and methods of operations used to transform raw materials or information into products or services"* (Subramaniam & Nilakanta, 1996, p. 637). In general, technical innovations can often be recognized as new product or service introductions or the introduction of new elements in the production process. An example of a technical innovation is the invention of the steam engine, which greatly improved the production process in many different types of factories and even catalyzed the Industrial Revolution. This dimension differentiates innovation types based on which part of the organization the innovation takes place in.

4.2.6 Innovation Matrix

It is remarkable that relatively few researchers combine multiple dimensions in order to make the typology more inclusive and relevant. A matrix that is used by some researchers (Damanpour et al., 2009; Edquist et al., 2001; Meeus & Edquist, 2006, p. 24) combines the typologies of process versus product, and technical versus administrative innovations, creating four different types of innovation. This matrix exists out of four quadrants: goods innovation, services innovation, technological process innovation and organizational process innovation. By creating such a matrix, innovations can be categorized in greater detail, which allows research to be more tailored to specific situations. Damanpour et al. (2009) investigated combinative effects of innovation types of organizational performance, and found that the effects of services and goods innovations were different, although they are usually both categorized as product innovations.

4.3 Analyzing Innovation Types

Reviewing the different types of innovation that can be found in existing literature, it seems like researchers investigating innovation often end up using the dichotomy of either radical versus incremental innovation (Damanpour, 1988; Germain, 1996; Koberg et al, 2002), or administrative versus technical innovation (Subramanian & Nilakanta, 1996). The reason for using these dimensions is often that they are of an inclusive nature, and applicable in almost any case. To decide which dimension of innovation will be used in the remainder of this research, the interrelationships, similarities and differences between the types of innovation mentioned in Section 4.2 will be discussed.

The first step of analyzing these different types of innovation is assessing where the differences come from. The differences can be explained by comparing the multiple dimensions, which shows that every dimension differentiates two types of innovation based on different grounds. The product versus process dimension focuses on whether the product or process design is innovated, whereas for example architectural and modular innovations are differentiated based on to what extent they affect a greater system. Because of these different perspectives, it is logical that a great variety of innovation dimensions exist in research. However, not all dimensions take such a conflicting perspective. Comparing the administrative versus technical and product versus process dimensions, it can be argued that these dimensions are to some extent similar. Both dimensions put emphasis on "where" in an organization is innovated, however, the differentiation is not made in the same way. Keeping in mind that a technical innovation often occurs as a new product or service introduction or the improvement of the product process, it can be argued that when an innovation can be labelled as either a product or process innovation, it automatically can be considered a technical innovation. The only exception would be a process innovation in the humanistic

department, for example improved training, which could be considered an administrative innovation. Administrative innovations do not directly lead to new products or services, but indirectly influence the process of producing them (Subramanian & Nilakanta, 1996).

Schilling (2013) identifies another relationship that product and process innovations are involved in. She argues that a positive interrelationship between the two exists, since one often leads to another. If a process innovation occurs and the production process is expanded, this often allows the design of new and better products and thus, often leads to product innovations. The other way around, in order to realize a product innovation, an innovation in the current production process is often required to enable the product introduction, which results in a process innovation.

Magnusson et al. (2002) found that architectural innovations often destroy competences, as they require changing the overall design of a system. This often results in organizations losing their core competences and a need to adapt to the new system. Therefore, it can be concluded that architectural innovations can often also be categorized as competence-destroying, whereas modular innovations are mostly competence-enhancing, as they build on the already existing system, representing the current core competences of an organization.

Modular innovations represent a change in only a small part of the system and do not affect the general system. Moreover, it was mentioned above that they are often competence-enhancing. Comparing these characteristics to those of incremental innovations, great similarities can be recognized, since incremental innovations are defined as minor improvements or simple adjustments in current technology. These similarities allow concluding that modular innovations are competence-enhancing, and can be regarded as incremental innovations. The other way around, architectural innovations are competence-destroying, and can be categorized as radical innovations. This does not necessarily mean that they possess a great degree of newness and differentness, as it was mentioned in Section 4.2 that an innovation which departs from a firm's current practices can also be considered radical.

For the remainder of this research, it is important to provide an inclusive typology of innovation. The analysis of established innovation dimensions showed that incremental and radical innovation capture most of the other dimensions, including architectural versus modular and competence-enhancing versus competence-destroying innovation. Therefore, this research will discuss best practices for the innovation process using the dimension of radical versus incremental innovation. The Innovation Company's customer portfolio mostly consists of technologically driven SMEs, which implies that their customers will mostly engage in product and technical innovation. However, as the goal is to make the best practices and assessment tool of this research as inclusive as possible, it will only use the dimension of radical versus incremental innovation and focus on SMEs in general.

4.4 Proposed Innovation Pentagon

The remainder of this research will provide best practices while differentiating between radical and incremental innovation. The other dimensions that were discussed in Section 4.2 have been investigated less regarding their implications for best practices. Even though the impact of the different dimensions on best practices are unclear, the dimensions surely differ greatly. When reviewing an innovation by one dimension, for example radicalness, the innovation is either considered as radical or incremental, or something in between. This does not indicate anything about the nature of the innovation, for example whether it is a product or process innovation. To provide managers with a better understanding of innovations, the innovation pentagon as presented in Figure 1 is proposed.

The innovation pentagon offers an inclusive way to discuss different innovations, while not restricting to a certain dimension of innovation. By using the innovation pentagon, five dimensions of innovation can be included in the discussion and innovations that only differ in one dimension, will still appear different in the pentagon. This way, even innovations that are highly similar will show differences and will not be considered to be equal.

The innovation pentagon uses five dimensions of innovation: radicalness, technicality, product relatedness, competence supportiveness, and newness to industry. The first dimension, radicalness, is defined by looking at the extent to which a technology and the relationship between its components is new and different to the organization. The second dimension, technicality, describes the extent to which an innovation can be considered technical, as opposed to administrative. Product relatedness as a dimension describes whether the innovation concerns the development of a new product, or is related to a process innovation instead. Fourth, competence supportiveness assesses the extent to which the innovation builds on current organizational competences. If the innovation requires new processes and makes current organizational processes obsolete, the innovation scores low on competence supportiveness. Finally, the dimension called newness to industry describes the extent to which an organization is new to the industry as a whole. The first dimension, radicalness, only considers the newness and differentness of the innovation to the organization itself, whereas this dimension examines whether the innovation is also new to the industry.

The use of the innovation pentagon is relatively straightforward; one assesses an innovation on every dimension and continues by drawing the pentagon as it fits the innovation. Its use allows for a better understanding of innovations by managers and the easier recognition of differences and similarities between innovations. Moreover, academics can use the matrix to ensure the completeness of their definition of innovation, rather than limiting themselves to a single dimension.

The dimension of architectural versus modular innovations is not included in the innovation pentagon, as this dimension is represented in the radicalness dimension. The definition of radicalness that is used includes the extent to which the relationship between components is new, which makes the dimension of architectural versus modular innovations more or less obsolete. The dimension newness to industry was decided to be more relevant to describe innovations and therefore, this dimension was included instead.

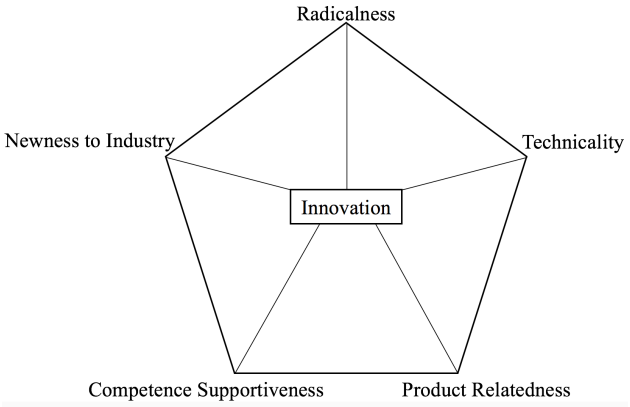


Figure 1: Innovation Pentagon

5. INNOVATION ASSESSMENT TOOL

5.1 Theoretical Background

5.1.1 Radical and Incremental Innovation

Researchers found that when the goal is to stimulate a certain type of innovation within the organization, best practices differ for different types of desired innovation (Damanpour, 1988; Ettlie et al., 1984). As mentioned in Section 4.3, the dimension of innovation that will be used to describe best practices is the dimension of radicalness, with on the one end incremental innovation, and radical innovation on the other. Damanpour & Wischnevsky (2006) found that established firms are likely to both adopt and generate innovations, whereas entrepreneurial firms, such as SMEs and start-ups, are more likely to limit themselves to the generation of innovations.

Damanpour (1988) identifies different predictors for incremental and radical innovation in different stages of the innovation process. *"The initiation stage consists of all activities pertaining to problem perception, information gathering, attitude formation and evaluation, and resource obtaining leading to the decision to adopt. The implementation stage consists of all events and actions pertaining to modifications in both the innovation and the organization, initial utilization of the innovation, and the continued utilization of the innovation when it becomes a routine feature of the organization"* (Damanpour, 1988, p. 7). Damanpour's (1988) research is specifically directed towards the adoption of innovations, however, his findings may be generalized for the generation process as well, since the results are very relevant for the generation of innovations too and can easily be applied by SMEs.

Damanpour (1988) found that few differences exist in best practices for incremental and radical innovation in the initiation stage, since *"both types of innovations would go through the same stages of problem perception, idea generation, and the adoption decision"* (Damanpour, 1988, p. 13). However, it was found that incremental innovations are often initiated by specialists situated low in the organizational hierarchy, whereas radical innovations are initiated either by high-level managers or professionals working in specialized groups, such as in R&D or product development. To stimulate incremental innovation, managers could benefit from using mechanisms like worker involvement programs, quality circles and suggestion systems. Radical innovations, however, are facilitated by structural components such as a R&D-departments, venture units and the formal education of managers and scientists. These findings imply that the initiation of incremental innovation is stimulated by enhancing the involvement and decision-making ability of lower-level employees, whereas radical innovation is promoted by establishing specialized departments and enhancing high-level employees' skills.

The greatest difference in best practices occurs at the implementation stage. In general, Damanpour (1988) argues that *"the greater the radicalness of an innovation, the greater the conflict in roles, power, and status; hence the more difficult the implementation of a radical innovation"* (p. 15). Since the implementation of radical innovations often requires new technologies, personnel and skills, it often leads to changes in the structure of the organization, as well as changes in roles, power, and status of employees. To facilitate the implementation of radical innovation and overcome possible problems because of the aforementioned changes, researchers propose to install a temporary "parallel" structure (Damanpour, 1988; Galbraith, 1982; Nord & Tucker, 1987; Stein & Kanter, 1980). Such a parallel structure is a temporary innovative structure, installed next to the permanent structure, with characteristics of both organic and mechanistic structures, which facilitates radical innovation. Making these findings more practical, it can be argued that the implementation of a radical innovation should not directly occur in the entire organization. Research recommends to first implement the change in a smaller, more innovative part of the organization, so implications and possible problems can be identified, before putting it to use in the entire organization (Damanpour, 1988). Making a radical change in the entire organization affects employees greatly, and it is beneficial to know how it will affect them before implementing it, so possible problems can be managed properly. Incremental innovations, on the other hand, can be implemented on the organizational level directly, as the impact on employees and their jobs is significantly smaller and needs less extensive guidance.

Germain (1996) found a positive association between innovation radicalness and costs, thus proving that radical innovations require a greater amount of capital than incremental innovations. Moreover, it was found that radical innovations are significantly less adopted than incremental innovations, because of high costs as well as risk (Germain, 1996; Koberg et al., 2002).

When discussing predictors of radical innovations, Germain (1996) found that environmental uncertainty is positively related to innovation radicalness. Organizations operating in uncertain environments are more likely to adopt radical innovations, since the dynamism requires a more future-oriented approach and makes organizations more aware of external change, which makes them more receptive to original solutions. From these findings, one can conclude that organizations aiming to adopt and generate radical innovations should have a future-oriented approach and great awareness of external changes and developments, since radical innovations are often found and thought of by identifying opportunities in the external environment. Moreover, Germain (1988) found that *"radical innovation is positively predicted by specialization, inversely predicted by integration, and not predicted by decentralization"* (p. 8). On the other hand, organizations pursuing incremental innovations do not benefit as much from a future-oriented approach or extensive environmental awareness. *"Regarding structure, specialization and innovation adoption decentralizations predict incremental innovation, whereas operations decentralization and integration do not"* (p. 9).

Koberg et al. (2002) found other relevant predictors of radical and incremental innovation. First of all, they found that intrafirm structural linkages predict both incremental and radical innovation, since firms with interdependencies across projects and product lines allow for a free flow of information. It is stressed that innovation is rather a team effort than an individual effort, and thus input of multiple people should be considered (Koberg et al., 2002; Scott & Bruce, 1994; Spender & Kessler, 1995). It was found that larger and older firms are more likely to develop incremental innovations. Moreover, Koberg et al. (2002) suggest that *"the ability of managers to experiment and to move quickly and smoothly from one project or product to another is an important factor in explaining radical innovation"* (p. 20), whereas these processes are less important for incremental innovation. Experimentation can be defined as the ability to proactively pursue and recognize new opportunities in an early stage, while simultaneously being able to react to moves of competitors (Brown & Eisenhardt, 1998; Koberg et al., 2002). Koberg et al. (2002) confirmed Germain's (1988) finding about environmental dynamism: it is a greater predictor of radical innovation than of incremental innovation.

Findings related to managers were that as the age of the CEO decreased, incremental innovation increased. Previous research found the opposite, namely that younger CEOs are more likely to cause radical innovations (Bantel & Jackson, 1989; Wiersema

& Bantel, 1992). Koberg et al. (2002) argue that their findings can be explained by the size of the firms they investigated; it is argued that younger managers in large firms feel uncomfortable or unable to make great changes to the current system and thus, resort to incremental changes.

Subramaniam & Youndt (2005) investigated the influence of different types of intellectual capital on radical and incremental innovation. They found that organizational capital is positively related to incremental innovation capability. *"Thus, institutionalized knowledge accumulated in and utilized through an organization's patents, databases, structures, systems, and processes seems to help it reinforce its prevailing knowledge and, consequently, augments its incremental innovative capabilities"* (p. 8). However, social capital, which can be understood as the information sharing and collaboration between employees, did not further enhance an organization's incremental innovation capability.

Human capital, defined as the knowledge, skills and abilities residing with and utilized by individuals (Schultz, 1961; Subramaniam & Youndt, 2005), was found to have a negative influence on radical innovative capability (Subramaniam & Youndt, 2005). This is an interesting finding, since it implies that individual expertise does not lead to radical innovation. *"In fact, having fiercely independent experts reluctant to share their ideas with their colleagues may be counterproductive for organizations"* (Subramaniam & Youndt, p. 10). This was confirmed by one of the most important findings of their research, namely that the combination of high human and social capital positively influenced radical innovation capability. This means that *"unless individual knowledge is networked, shared, and channeled through relationships, it provides little benefit to organizations in terms of innovative capabilities*" (Subramaniam & Youndt, 2005, p. 10). Their findings prove that interrelationships and communication are crucial to innovation capability, especially for stimulating radical innovation.

Un (2010) mentions that one of the greatest dilemmas in innovation management is how to achieve balance between radical and incremental innovation (Smith et al., 2006). Her research focuses on how to balance both radical and incremental innovation capabilities on the individual level, but argues from a managerial point of view. She distinguishes two types of management practices, namely the organization-level and the team-level. *"The system of organization-level management practices consists of experience-based recruitment, career development, and joint performance-based compensation implemented without a specific innovation project in mind. The system of team-level management practices consists of employee selection based primarily on overlapping knowledge with other team members; training and reward is given for working in a project team on a specific innovation project"* (Un, 2010, p. 15). She found that the organization-level management system is better for stimulating radical innovations, since it creates greater psychological safety, which fosters radical innovation. On the other hand, team-level management practices foster incremental innovation. Implementing both systems simultaneously is only beneficial for incremental innovation, however, it is generally very costly (Un, 2010) and thus, difficult to realize for SMEs.

One of the most popular tools used in innovation management is stage-gating. Stage-gating is a process where a multidisciplinary team decides at a few moments (gates) during the innovation process whether the innovation will receive the necessary resources to proceed to the next stage of innovation (Cooper, 1990). Sethi and Iqbal (2008) found that *"the stage-gate process has the potential of harming novel new products"*, because *"it is problematic to aim for both rigorous gate controls and successful novel products simultaneously"* (p. 13). Moreover, they found that the committee that decides on the progress of the radical projects needs to be different from that of incremental projects, as a different mind-set is required to evaluate the progress of radical innovations. These findings are supported by Koen (2004), who found that *"the stage-gate process is an effective tool for accelerating incremental product development. However, it cannot be directly used for* (…) *breakthrough products"* (p. 7).

5.1.2 Best Practice Frameworks

The previous section described research where best practices were found to be different for incremental and radical innovation. This section will focus on best practices to stimulate innovation in general, without specifically promoting a certain type of innovation. To ensure that this research can be considered complete, several extensive best practices frameworks will now be discussed.

Kahn et al. (2006) developed a best practices framework for new product development (NPD). Their research uses PDMA's (2004) work on NPD certification and categorizes best practices in six NPD management dimensions, namely strategy, portfolio management, process, market research, people, and metrics and performance evaluation. To develop their best practices framework, Kahn et al. (2006) reviewed benchmarking studies of NPD practices. They categorized every best practice into one of their six categories, and developed a maturity model for every category of NPD practices. Their maturity model knows four levels of sophistication, which are called poor, better, good and best practices.

This research does not directly adopt Kahn et al.'s (2006) best practices, but rather focuses on the framework proposed by Nicholas and Ledwith (2006). Nicholas and Ledwith (2006) adapted Kahn et al.'s (2006) model so it would specifically fit the NPD process of SMEs. As this research is directed towards best practices for SMEs as well, Nicholas and Ledwith's (2006) model was chosen over Kahn et al.'s (2006).

Nicholas and Ledwith (2006) use the same six categories of the NPD process, which they call key process areas (KPAs). Their research also categorizes the six KPAs in a maturity model, but they use five levels of sophistication. *"A Capability Maturity Model (CMM) is an organizational model, which describes using a number of levels or stages, the way in which an organization manages its processes. Each maturity level is a well-defined plateau, which provides a foundation for the next level resulting in continuous improvement"* (Nicholas & Ledwith, 2006, p. 3). For every KPA, Nicholas and Ledwith (2006) developed five levels of sophistication, which are called Initial, Under Development, Defined, Managed, and Optimized. Every level of sophistication provides several statements that help managers to recognize in which stage they are with their organization, and what improvements have to be made to progress to the next stage. This way, the tool offers an accessible way to strive for optimization in every KPA within SMEs.

Another best practices framework that was used, is that of Ernst (2002). Ernst (2002) investigated success factors of new product development through conducting a review of the empirical literature. Ernst structured his success factors of NPD in five broad categories, namely NPD process, organization, culture, role and commitment of senior management, and strategy. Ernst (2002) did not develop the success factors into a maturity model like Nicholas & Ledwith (2006) and Kahn et al. (2006) did, but rather provided a categorized list of success factors for the innovation process.

5.2 Best Practices for SMEs

This section will provide recommendations on best practices for stimulating certain types of innovations. The findings from Section 5.1 will be used, and instructions on how to implement these findings in SMEs will be given. The exact way of implementing the best practices will differ per case, but the goal is to provide guidelines on the level of SMEs, so managers will find it easier to successfully stimulate innovation with limited resources.

5.2.1 Promoting All Types of Innovation

It was discussed previously that some practices enhance innovativeness without discriminating between radical or incremental innovation. Both types of innovation benefit from these practices, and can therefore be considered prerequisites of enhancing innovativeness. The three identified practices stimulating both types of innovation are specialization, intrafirm structural linkages, and social capital.

When specialization is high, the employees of a firm carry a greater knowledge base and it is easier to cross-fertilize ideas, making it easier for organizations to innovate (Aiken & Hage, 1971; Damanpour, 1991; Germain, 1996; Kimberly & Evanisko, 1981). This means that organizations should reduce the number of tasks employees have to a minimum, which leads to increased specialization. The less tasks an employee has, the more he will specialize in those tasks that he still has. Great specialization leads to a deeper knowledge of the task, which means that employees can think of better and more creative solutions to problems, thus enhancing innovation. SMEs can implement this by specializing employees to a limited number of tasks, rather than giving them a great set of tasks. This way, employees develop a deep understanding of a few tasks, instead of having a less in-depth understanding of a greater number of tasks, which contributes to their ability to think of innovative solutions to problems.

Specialization alone, however, does not necessarily mean that innovativeness is enhanced. It is important that these specialists collaborate and share their knowledge, which leads to the other two identified practices that stimulate both types of innovation. Intrafirm structural linkages are necessary to stimulate innovativeness, because it forces specialists to share their deep knowledge with specialists in other fields (Koberg et al., 2002). The result of these linkages is a free flow of information between specialists, enhancing changes of developing an innovation together. To implement this in SMEs, managers could assign different specialists to the same project team, or organize meetings with different specialists to discuss innovative solutions. The deep knowledge of the specialists and their collaboration will likely result in more and better innovations.

The promotor of both radical and incremental innovation, social capital, is defined as *"the knowledge embedded within, available through, and utilized by interactions among individuals and their networks of interrelationships"* (Subramaniam & Youndt, 2005, p. 2; Nahapiet & Ghoshal, 1998). This best practice is similar to the previous one, but has one specific difference. The intrafirm structural linkages are embedded within an organizational structure, in the form of project teams or scheduled meetings, whereas social capital can rather be described as teamwork. To implement this best practice in SMEs, managers should try to promote teamwork in firms, for example through teambuilding exercises or activities that stimulate the relationships between employees. When the different specialists feel comfortable collaborating, their work is more likely to result in successful innovations.

The best practices for NPD in SMEs as found by Nicholas and Ledwith (2006) and the success factors found by Ernst (2002) also promote innovation in general, without specifically promoting radical or incremental innovation. However, as their work is very extensive, the specific best practices found by these researchers (Ernst, 2002; Nicholas & Ledwith, 2006) are only introduced in Section 5.3, where the proposed assessment tool is discussed.

5.2.2 Promoting Radical Innovation

First of all, it is important that managers understand that radical innovations cannot be created on a regular basis. They occur significantly less than incremental innovations, are costlier, and carry more risk (Germain, 1996; Koberg et al., 2002). To stimulate radical innovation, it is important that everyone understands these characteristics of radical innovations and is patient. If this is not the case, managers should educate their employees involved in the innovation process that not every idea can turn into a success. Impatience in the innovation process can lead to disagreements and discussions, which only hurts innovativeness.

Since radical innovations are generally initiated by high-level managers or professionals in specialized groups (Damanpour, 1988), it is recommended for organizations stimulating radical innovation to establish specialized departments or train high-level employees. The establishment of a specialized R&D-department may not be feasible for all SMEs; in that case, specialists focusing on innovations should be located together, or at least work together on a regular basis. If such a department or cooperation already exists, then it is recommended to train the organization's specialists even further through submitting them to additional education (Damanpour, 1988). Educating specialists further may inspire them to come up with new ideas, thus leading to enhanced radical innovation. Moreover, it could give them the missing skills to develop a new product.

Several best practices exist specifically concerning the manager of an organization when the goal is to stimulate radical innovation. Koberg et al. (2002) found that younger managers decrease radical innovation, but argue that this effect is due to the size of the organizations they investigated. This research focuses on SMEs, which means that the effect of organizational size will disappear. Therefore, it is argued that younger managers stimulate radical innovation in SMEs (Bantel & Jackson, 1989; Wiersema & Bantel, 1992). When the goal is to stimulate radical innovation, it is thus recommendable to hire young managers for the innovation process. Next to that, the manager should possess the ability to experiment and quickly move between projects, which means that he should easily pursue and recognize opportunities. When applying this to SMEs, this means that managers should be willing to take responsible risks and be aware of the external environment. The manager should be aware of the latest technology and trends in the industry, so he can better stimulate radical innovation. Staying up-to-date with the environment allows firms to recognize new opportunities earlier, thus increasing the chances of developing an innovation.

When thinking about how SMEs can implement this best practice, the importance of a future-oriented approach should also be considered. As mentioned before, managers need to be aware of the external environment and have the ability to experiment (Brown & Eisenhardt, 1998; Koberg et al., 2002). They can be greatly assisted in doing this by an organization that adopts a future-oriented approach towards their dynamic external environment, which is another predictor of radical innovation (Germain, 1996). Such an approach can be adopted by conducting regular environmental analyses to know what is out there. Moreover, SMEs could visit events such as industry fora

and conferences to learn from competitors or learn new techniques. This is a relatively cheap way to learn about your external environment. Moreover, to guide this process of becoming more environmentally aware, it is important that a long-term strategy is established. Such a strategy gives psychological security to employees and stimulates them to take greater risks, which increases the odds of developing radical innovations.

Integration inversely predicts radical innovation (Germain, 1996), which is due to the fact that in highly integrated organizations, employees may fear radical innovations in another department, as it may greatly influence their department. In highly integrated organizations, concerns for power and prestige may arise in disagreements over which division will introduce and control new innovations (Burns & Stalker, 1961; Germain, 1996). This risk is lower in SMEs, as divisions are more interdependent and will likely also benefit from a radical innovation. However, the risk that disagreements over power arise will always exist and should be prevented. This should be done through the previously mentioned long-term strategy, which gives psychological safety to employees, as well as promoting collaboration between specialists in different departments.

Another previously identified best practice is a high amount of human capital, which can be understood as the level of skills and knowledge of an organization's employees. It sounds obvious that in order to stimulate radical innovation, a high skill level of employees is required. However, it was found by Subramaniam & Youndt (2005) that high human capital only stimulates radical innovation in combination with high social capital. Since social capital is mentioned as a promoter of both types of innovation in general, it is assumed that organizations strive to maximize social capital. In that case, a best practice to stimulate radical innovation within SMEs would be to hire employees that are highly skilled and educated, or train existing employees so their skill level increases. This kind of training would make the employee more valuable to the organization and could help them develop the skills to come up with a breakthrough innovation.

Un (2010) found other specific best practices to enhance radical innovation. She describes her best practices as organization-level management practices, consisting of experience-based recruitment, career development, and joint performance-based compensation, implemented without keeping specific innovation projects in mind. It is not very complicated to implement these practices in SMEs. First of all, the experience-based recruitment should be applied by the manager of the SME. When hiring for a position, like mentioned before, SMEs should search for the best possible fits and the most skilled applicants. This way, the human capital is enhanced, which leads to improved radical innovativeness (Subramaniam & Youndt, 2005). Career development falls in line with the previously mentioned best practices of educating employees and adopting a future-oriented strategy with the organization (Damanpour, 1988; Germain, 1996). Offering employees plans for the future provides them with the necessary psychological comfort to step out of their comfort zone and come up with radical innovations (Un, 2010). Finally, the joint performance-based compensation implies that employees should be paid based on performance. However, they should be rewarded rather on the performance of their department or business unit, instead of their individual performance. Compensating employees based on their own performance would reduce risk-taking, which reduces radical innovations (Un, 2010). Therefore, rewarding employees based on organizational performance would lead to enhanced radical innovativeness, as employees strive to come up with innovations that improve organizational effectiveness.

Finally, Damanpour (1988) argues to first install a temporary parallel structure to try out the innovation in a small part of the organization. Although this may be harder to implement in SMEs, it is not impossible. Often, radical innovations are recognized by a select group of specialists, either high-level managers or R&D-specialists. When this is the case, it may be wise to first test the effects of the innovation in, for example, the R&D-department. If disadvantages are small and the employees react positively to the innovation, it can gradually be implemented in the whole organization. However, the manager should always pay close attention to how the employees react to the new innovation. Some employees may be scared by the innovation, fearing it may interfere with their position in the company or even scared to lose their jobs. In those cases, managers should personally address the employees and make them comfortable with the new situation.

Following from theory, stage-gating can be a helpful tool in radical innovation, but it has to be implemented very carefully. Sethi and Iqbal (2008) found that stage-gating can be helpful in radical innovation development, but the committee needs a different mindset and less rigorous controls than for incremental innovations. For SMEs pursuing radical innovations, this means that they can use stage-gating to effectively allocate resources to the right projects, but the KPIs for the radical projects need to be less strict. The team judging the progress of the innovations should be multidisciplinary and diverse, to make sure that projects are not judged too fast. It is important that projects get time to show their potential, so they should not be cancelled prematurely in an early stage. To identify potential of radical innovations, the members of the stage-gating committee should have expertise in different fields.

5.2.3 Promoting Incremental Innovation

After discussing innovation best practices (Section 5.2.1) and best practices for stimulating radical innovation (Section 5.2.2), the predictors and best practices of incremental innovation will now be discussed.

Incremental innovations are often developed by specialists low in the hierarchy (Damanpour, 1988). To utilize this characteristic in stimulating incremental innovation, it is recommended for organizations to enhance the involvement and decision-making ability of these low-level workers. Within SMEs, employee involvement can be enhanced by providing them with long-term contracts, so they know their future within the organization is secure. Moreover, managers could develop a close relationship with the employees and let them know their work is appreciated. To enhance the decision-making ability of employees, the first step for managers would be to give the low-level employees more freedom to make those decisions. Secondly, managers could provide the employees with additional education or training regarding decision-making. The most important thing is, however, that the low-level employees get the necessary freedom to make their own decisions, rather than following the manager. This way, they are more likely to develop incremental innovations. These recommendations are also in line with Germain's (1996) finding that innovation adoption decentralization stimulates incremental innovation.

Another best practice to stimulate incremental innovation is by maximizing organizational capital (Subramaniam & Youndt, 2005). Organizational capital is the infrastructure of knowledge within the firm that employees use in their work, for example through patents, manuals and processes. Managers of SMEs can enhance organizational capital by optimizing the information structure of the firm, for example continuously updating databases, reviewing possibilities for patents, and writing clear manuals and instructions for their employees. Clear instructions

will lead to a better understanding by employees of their tasks and allows for greater decentralization, since the most important decisions by management are already captured in the instructions. Therefore, maximizing organizational capital can be done in one way through high formalization, thus providing employees with clear and useful rules, regulations and instructions for their job. The high formalization creates a better understanding of their jobs for low-level workers, which allows for a greater focus on the actual work they are performing. This way, the chances of developing an incremental innovation are enhanced.

Using the same argumentation as in Section 5.2.2, it can be argued that hiring more experienced managers would lead to more incremental innovations at SMEs, since younger managers promote radical innovation (Bantel & Jackson, 1989; Wiersema & Bantel, 1992). For SMEs pursuing incremental innovations, it is thus advisable to hire older managers responsible for the innovation process, as they are more likely to focus on incremental innovations.

To promote incremental innovation in an organization, the manager should adopt team-level management practices, consisting of employee selection based on complementary knowledge with team members, and training and reward are given for working in a team on a certain innovation project (Un, 2010). Comparing this to the recommended best practices for radical innovation, it can be seen that the hiring and rewarding system for incremental innovation is more directed towards teamwork on a specific project, whereas radical innovation tries to stimulate risk-taking. An SME's manager can implement these practices by making a profile of a perfect fit for the team when hiring a new employee, rather than only looking at the applicants' competences. To stimulate incremental innovation, it is more important that the new hire fits within the team, than that he or she possess exceptional capabilities (Un, 2010). Moreover, employees should be compensated based on team performance in a specific project, rather than on their individual or organizational performance. This way, risk-taking is reduced and employees focus themselves more on the project they are working on. This increased focus on the actual tasks enhances the possibility of developing an incremental innovation, as mentioned before.

As opposed to radical innovations, incremental innovations can directly be implemented on the whole organization. They do not first need to be assessed on their impact or drawbacks, since they typically have low resistance and few problems come from implementing incremental innovations (Damanpour, 1988). For SMEs, this means that when an incremental innovation is discovered, it should be implemented or commercialized directly, therefore maximizing its benefits and profits.

It was found that stage-gating is a highly effective tool in the innovation process of incremental innovations (Koen, 2004; Sethi & Iqbal, 2008). As opposed to radical innovation, the stage-gating process for incremental innovations can be more rigorous and the committee does not necessarily need to be very diverse. For SMEs, this means that the team can consist of any group of multidisciplinary members and the KPIs for innovations can be followed strictly. If a NPD project does not live up to the expectations, it should be cancelled and the resources should be allocated elsewhere.

5.3 Innovation Assessment Tool

The best practices described in Section 5.2 can be used to assess an organization's current effectiveness regarding innovation practices. The development of such an assessment tool can be used to provide a benchmark for The Innovation Company's "innovation assessment". The proposed assessment tool can be found in Table 1.

The proposed assessment tool is based on Nicholas and Ledwith's (2006) NPD best practices framework, Ernst (2002) overview of success factors in NPD and the previously described literature (Section 5.2) on best practices for innovation. The tool uses Nicholas and Ledwith's (2006) tool as its foundation, thus using the following six dimensions: strategy, process, performance evaluation, people, portfolio management, and market research (Kahn et al., 2006; Nicholas & Ledwith, 2006; PDMA, 2005). Moreover, it uses Nicholas and Ledwith's (2006) five levels of sophistication.

The assessment tool takes Nicholas and Ledwith's (2006) framework as its starting point, by using their framework as the basis on which to expand with other researchers' findings. The success factors of NPD that Ernst (2002) found were added to the framework. First, his findings had to be categorized according to Nicholas and Ledwith's (2006) six key process areas. Thereafter, since Ernst's (2002) findings only existed out of success factors, his results had to be adapted to fit the maturity model. His findings were compared to what was already in Nicholas and Ledwith's (2006) framework, and were included in the framework wherever they were missing. The success factors were transformed into statements that fit the maturity stages, in order for Ernst's (2002) findings to be incorporated in Nicholas and Ledwith's (2006) model. Since Ernst did not specifically focus on SMEs, his success factors were critically reviewed to see whether they were also relevant for SMEs. When transforming his success factors to statements for maturity stages, the applicability for SMEs was also kept in mind.

The expanded framework was further improved by including all best practices that were described in Section 5.2. These best practices were then categorized within the six KPAs and checked whether they were already included in the framework. In case they were missing, the best practices were formulated as maturity stages and included in the framework.

Since some best practices were found to stimulate one certain type of innovation, either radical or incremental innovation, the framework has to differentiate between best practices that stimulate radical, incremental, or both types of innovation. This is done through including different colors in the framework. Statements written in black are important for any type of innovation, but statements written in red are specifically important for stimulating radical innovation, whereas blue statements are only important for the stimulation of incremental innovation.

Managers can assess their organization's performance by comparing it to the statements in the proposed assessment tool. Managers can then identify in which maturity stage the organization is situated, and can recognize possible improvements by looking at the statements in the next maturity stages. The tool offers an accessible way for SMEs to assess and enhance their current performance regarding the innovation process.

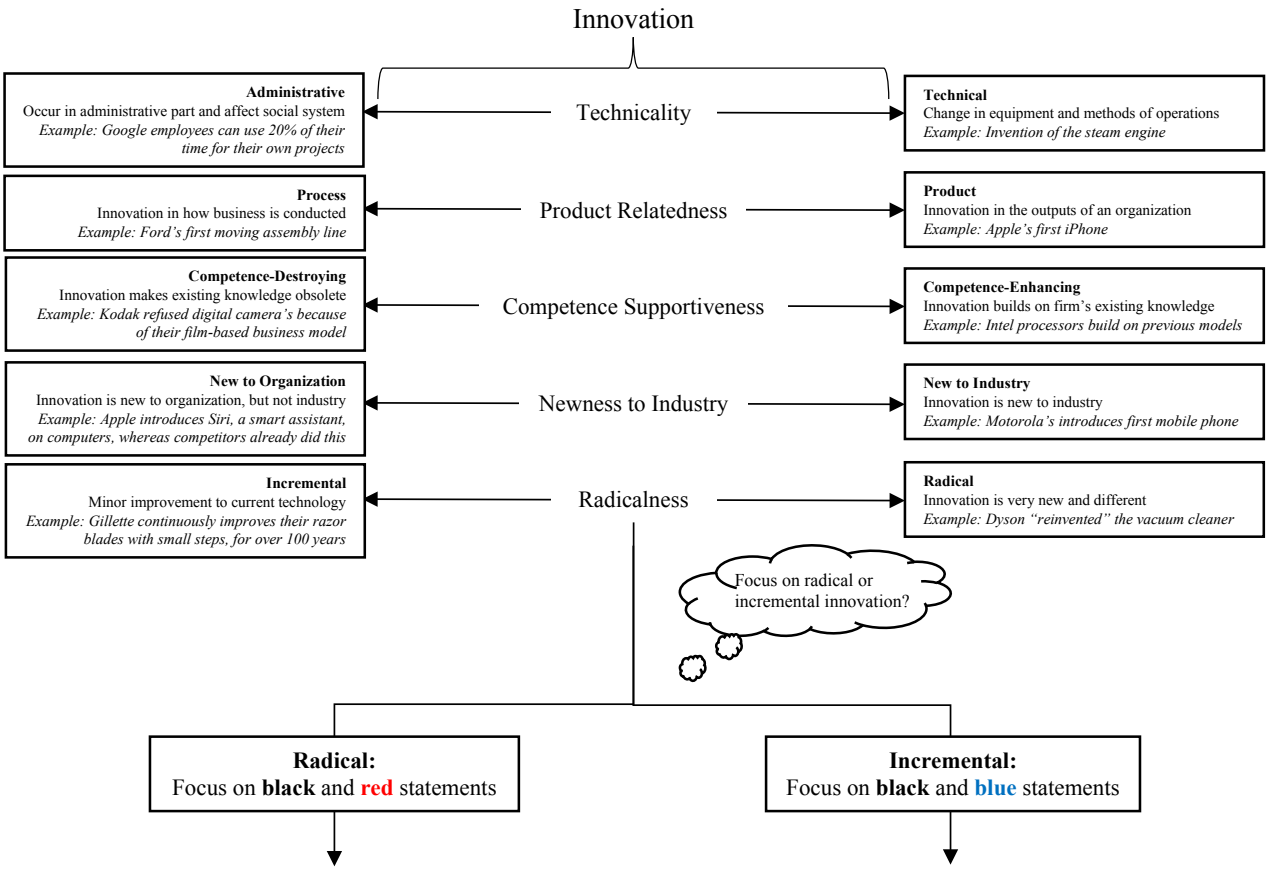
In the next figure, Figure 2, a visual representation is provided of the content discussed in this research. The visual representation shows the different dimensions of innovations that were identified and the examples that were provided for each dimension. Then, the radicalness dimension is chosen and best practices are identified for SMEs. The figure shows how the assessment tool uses different statements for either radical or incremental innovation, and an overview of the assessment tool is provided. This visual representation is useful for managers of SMEs to create a better understanding of the results of this research.

Key Process Area	Initial	Under Development	Defined	Managed	Optimized
Strategy	No NPD strategy Short-term view of NPD NPD not recognized as being crucial to long-term survival of organization Availability of funding drives project selection NPD program does not have any objectives	Unclear NPD strategy Some NPD projects are aligned with NPD strategy but in general do not fit NPD strategy not in line with overall organizational mission statement NPD projects are identified during budget process and resources allocated accordingly Objectives of the NPD program are unclear NPD strategy does not give overall direction to individual projects	NPD strategy has been defined but may be vague in parts NPD strategy mostly aligned with organization's mission statement Most NPD projects are aligned with NPD strategy allowing a certain amount of flexibility NPD strategy can be redirected in real time to respond to market forces Organizational mission and NPD strategy drive NPD project selection Objectives of the NPD program are defined	Clearly defined NPD strategy NPD strategy clearly aligned with organization's mission statement All NPD projects are aligned with NPD strategy unless they were approved by senior management Quantitative goals for NPD Strategic plan identifies arenas of opportunity Market study is undertaken to guide strategic plan NPD program has clear objectives NPD strategy gives support and guidance to projects	Clearly defined strategy with organizational awareness of the strategy Mission and strategic statement define strategic arenas for new opportunities NPD strategy is continually being reviewed and updated to be kept in line with the organization's strategy and to reflect changes to the market place Objectives of the NPD program are understood and supported throughout the organization The importance of attaining the NPD objectives for the organization is clear Long-term strategic view of NPD
Process	No NPD process exists NPD is unorganized and ad-hoc No NPD process owner No project champion No idea suggestion scheme Organizational information (patents, manuals, databases) is not shared	Informal processes exist for some stages of the NPD process Process can be easily circumvented No set process with different groups using their own processes Little documentation exists A project champion is vital to project success Every innovation goes through the same implementation process Organizational information is shared, but not structurally	Formal process exists for NPD and are utilized for most projects NPD process documentation is available Champions may play a role but are not critical to success Idea generation is structured and formal One individual can be clearly identified as the process owner The development process addresses the whole product cycle Employees get the opportunity to suggest new products The implementation of radical innovations receives special attention Organizational information is shared and used structurally by some departments	Formal process exists for NPD and are utilized for every project Stage-gate process may be employed however the process or gates may not be clearly defined and may vary across the organization The NPD process is also flexible and adaptable to meet needs of individual projects Time critical projects may skip stages of process The NPD process is visible and well documented There is an apparent NPD discipline Stage-gate process is the same for radical and incremental innovations Radical innovations are implemented with great care for possible problems Organizational information is shared through a company-wide infrastructure	Personnel are well disciplined in using to process to develop ideas Organization is striving to continually improve its NPD performance Improvement of the process is the responsibility of management as well as the project teams A special scheme exists where employees systematically suggest new products Radical innovations are first tested in a small part of the organization, before implementing it in the whole organization Stage-gate process for radical innovations is less rigorous Stage-gate committee exists out of diverse team of experts One formal and rigorous stage-gate process is utilized across the entire organization Go No-Go criteria are clearly pre-defined before each gate The organizational information infrastructure within the organization is continuously updated and shared by all members of the organization
Performance Evaluation	No standard criteria for evaluating projects No criteria for evaluating overall NPD effort Projects never killed	There are some general principles for evaluating projects however most are informal in nature Revenue is predominant metric for NPD success Performance may only be measured at the end of the project One person does all the evaluations Some projects may be killed Feasibility studies are not conducted Incremental and radical innovations are evaluated equally	There are formal processes in place for evaluating projects and are used in for most projects Team approach is used to evaluate and make final decisions Projects can be killed at any stage of development Performance measured at various stages of the project Variables such as lead time, project schedule slippage are tracked for projects Feasibility studies are occasionally performed during NPD process Management is aware that evaluating radical innovation requires more attention	Quantitative goals have been set for the company NPD performance Scoring models checklists are used to evaluate projects Senior management and project team responsible for project evaluation Management must approve really new ideas or big projects Multiple review points exist Metric data is tracked and stored Metric data can be readily accessed for analyses Performance measured continually throughout duration of the project	There is a standard set of criteria for evaluation of overall NPD effort A formal stage-gate process is utilized to evaluate the projects as they move from one stage of development to another There is a group charged with the task of evaluation Metrics are used to continually improve the NPD process Innovations are continuously being assessed commercially during the NPD process Feasibility studies are conducted continuously during NPD process Performance of radical innovations is assessed by diverse team of experts

				Radical innovations have evaluation metrics that are specialized for that project	There is a standard set of criteria for evaluation individual projects Stage-gate process for incremental innovations is strict and rigorous
People	NPD is performed by individuals Individuals are unorganized No project leaders Personnel take on too many projects No identifiable NPD team No training given to people involved in NPD Prevalent departmental silos "Over the wall" technique is used between department where one department completes their section of a project and passes it on without any consultation with other departments Innovative behavior is not supported The individuals working on NPD are not committed Employees do not have time to work on their own ideas Employees work on a wide range of projects at the same time Teamwork is non-existent in the organization Hiring process is unstructured No reward system is in place Employees are not considered when implementing radical innovations Manager in charge of innovation process is not willing to take risks No career development plans exist for employees Employees and management do not have any relationship Manager in charge of innovation is inexperienced No rules and regulations exist for low-level employees Low-level employees play no role in the innovation process	NPD is decentralized within each department A champion may shepherd projects and is essential for project success Some people are employed full-time for NPD No NPD teams but personnel are employed from a range of different departments Little or no training given Creativity by people not directly involved with NPD may be stifled Management become aware that structure amongst the personnel is important for project success Management recognizes importance of dedicating time of employees to work on their own ideas Employees only work on a few projects at the same time Some employees work together in teams Management implements a simple reward system Employees are hired through an informal process, unrelated to their skills or education Manager in charge of innovation process realizes that risk-taking is necessary for successful innovation Management recognizes importance of employees when implementing radical innovations Management develops relationship with some employees Some rules and regulations for low-level employees are in place Low-level employees play a small role in the innovation process	Departmental liaisons lead to established NPD teams (multifunctional team) Teams have regular meetings to discuss progress of NPD projects Each NPD project has a project leader Project leader is unqualified, lacks authority or cannot devote sufficient time to project Champions may exist but they are not necessary for project success Personnel limit number of projects they work on Creativity within the organization is encouraged Team accomplishments recognized and rewarded when performance is exceptional Some people are very committed to the NPD process Some employees can dedicate a bit of their time to work on their own ideas Employees focus on one project and help out with some other projects Most employees understand the importance of teamwork and participate in teams Training given to people employed fulltime in NPD Manager in charge of innovation process allows risk-taking in some cases The hiring process takes into account the education and skills of applicants Employees are rewarded based on organizational performance Some high-performing employees receive career development plans Employees are considered when implementing radical innovations Management is interested in employees and develops relationship with most employees Some employees receive long-term contracts The hiring process takes into account how the applicant fits in the team Some low-level employees receive training Manager in charge of innovation has some experience regarding the innovation process Low-level employees have rules and regulations that guide their main tasks Low-level employees can give their own input in the innovation process	Cross functional teams under lie the NPD process and are vital for project success NPD is team-focused Identifiable new product managers within business department Clearly identifiable project leader who accept ownership of the project Not all projects required to go through project group: some may be handled by departmental manager The project leader and team members show commitment to the NPD process Most employees can dedicate some of their time to work on their own ideas Employees focus specifically on one project and dedicate their time to it Teamwork is accepted by the organization Training given to people involved in NPD Manager in charge of innovation process allows risk-taking in most innovation projects Employees are hired mainly based on their skills and education Most well-performing employees receive career development plans Before implementing radical innovations, employees are informed Management develops relationship with all employees Most well-performing employees receive long-term contracts Employees are hired mainly based on how they fit in the NPD team Most low-level employees receive training to improve their skills Rules and regulations play an important role in the tasks of low-level workers Low-level employees are important in the innovation process and can suggest new innovations	Each project has a core team which remains on the project from beginning to end A NPD group exists and is purely dedicated to NPD work Project management software and techniques used to manage projects An innovation-friendly climate exists and people are willing to take risks Project leader accepts ownership of the project and is strong and responsible Project leader is qualified, has authority and sufficient time to devote to the project The NPD team is responsible for the entire project The project leader and team members show great commitment and personal interest in the NPD process Employees throughout the organization can dedicate some of their time to work on their own ideas All members of the project team are fully focused on that project Teamwork becomes the norm in the organization and is promoted by management Ongoing NPD training provided Newly hired employees are highly skilled and educated Manager in charge of innovation process supports risk-taking behavior in NPD process Employees are rewarded based on organizational performance and risk-taking is stimulated Career development plans are available for employees in the NPD process that perform well Employees are made comfortable with radical innovations before implementation Management develops close relationship with all employees Well-performing employees can expect long-term contracts Employees are hired team-complementary All low-level employees receive additional training to improve their skills Manager in charge of innovation is highly experienced Low-level employees are supported by strong system of rules and regulations

					Low-level employees play a crucial role in the innovation process and NPD projects are started from their input
Portfolio Management	No processes in place for portfolio management Portfolio management is responsibility of individuals No concern over types of projects being developed No projects prioritized No consideration given to organization's mission/strategic statement when undertaking NPD projects Projects may or may not be aligned Ability to secure funding drives project selection No balance in NPD portfolio Pet projects are prevalent Projects are never killed There are no long-term projects in the portfolio	Some portfolio management processes are in place though most are informal in nature Management have realized importance of good portfolio management Financial techniques are only method used to assess a products' financial return Some projects are aligned with the organizational strategy NPD projects prioritization occurs during budget process and resources allocated accordingly Pet projects exist A variety of projects supported with little regard to balance in portfolio NPD projects are reviewed Individually Some projects in the portfolio have a long-term focus	Formal portfolio management processes are in place and are utilized for most project Management are visibly involved in portfolio management Portfolio management is responsibility of project team and management Scoring techniques utilized to calculate a project's feasibility, risk strategic alignment, etc. Some projects may be prioritized by senior management The organizational NPD strategy drives NPD project selection and thus most projects are aligned with the organizational strategy Attention is paid to the type and mix of products being developed Pet projects exist only if approved by senior management NPD projects are reviewed by category or type There is a high number of projects in the portfolio that has a long-term focus	Formal portfolio management processes are in place and are utilized for every project Resources can be made available should an opportunity arise on the horizon Mapping techniques may be used to assess feasibility of a project. These mapping techniques allow trade-off between factors e.g. risk vs. profit All projects are aligned with the organizational strategy NPD projects are treated as one portfolio The portfolio can be recognized to have a long-term focus	A formal and systematic portfolio management process is in place with organizational awareness of the system A mix of techniques are used to ensure a prioritization of certain projects Keen consideration is given for balancing the number of projects and the available resources Organization is continually reviewing their portfolio management process in effort to improve its success There is a balanced variety of projects in the portfolio An idea bank exists Senior management takes responsibility for innovations NPD portfolio expresses a long-term thrust through a substantial number of long-term projects
Market Research	No market research performed No customer/user input in NPD No concept testing, market testing of any kind is undertaken No studies undertaken to gain knowledge regarding market place Pet projects are prevalent Product is undefined before development Competition is not observed Organization is not aware of environment	Management realizes possible benefits of market research Market research is still ad hoc and informal Market research is reactive in nature. Market research only performed in some cases Basic market research is performed but only after a project has already begun Focus limited to current organizational needs Evaluation of actual research results are poor Research performed is generally secondary in nature Pet projects still exist Product concept and target market are unclear before development Management recognizes importance of observing competitors Organization realizes importance of environmental analyses	Senior management takes keen interest in market research Market research is budgeted Market research used to develop product definition before project commences Market research more organized and formal in nature Market research more proactive in nature Market research of some variation is performed for most projects Some primary market research undertaken Qualitative research techniques are utilized Concept testing, product testing and market testing used in some projects Results of testing formally evaluated Go/kill/hold/recycle criteria exist based on market testing results Product concept and target market are thought of before development Some competitors are observed by organization Environmental analyses are conducted regularly	Product definitions are based on market research A formal market research function exists in the organization Market research performed for all NPD projects Primary and secondary techniques are utilized Concept testing, product testing and market testing used in most projects Customers form an integral part of NPD process Strict Go/kill/hold/recycle criteria exist Product concept and target market are clearly defined before development Most competition is actively observed Environment is well-known and analyzed regularly, so management is aware of opportunities and threats	Concept testing, product testing and market testing are consistently undertaken and expected in every project Market studies are on-going Market research is continuous process even after product launch Organization attempts to anticipate customers' future needs through continuous market research Product concept and target market are heavily investigated and clearly defined before development Competition is systematically observed through competitive landscaping analyses Environment is continuously analyzed and management are constantly updated about possible opportunities and threats

Table 1: Innovation Process Assessment Tool for SMEs



Key Process Area	Initial	Under Development	Defined	Managed	Optimized
Strategy		Current →			Goal
NPD Process			Current →		Goal
Performance Evaluation		Current →			Goal
People				Current →	Goal
Portfolio Management			Current →		Goal
Market Research			Current →		Goal

Figure 2: Visual Representation of Research

6. COMPARING ASSESSMENT TOOLS

In order to accurately compare The Innovation Company's assessment tool and the assessment tool proposed in Section 5.3, a clear description of The Innovation Company's tool has to be provided.

The Innovation Company's innovation assessment tool differentiates between several different "dimensions" within the definition of innovation. Firms are assessed on these dimensions by rating relevant statements within each dimension on applicability to the organization under investigation, varying from "totally disagree" (1) to "totally agree" (5). These types of scales are academically known as Likert scales (Likert, 1932) and are often used to measure items that are difficult to quantify, such as attitudes.

The Innovation Company's assessment tool is available in two different versions, one version directed towards SMEs and another version optimized for start-ups. The two versions are similar in its use, but have different dimensions and different statements to assess each dimension. The SME assessment tool has six dimensions of innovation that it assesses: innovation strategy, revenue and growth, type of innovator, team and organization, business model, and innovation performance. The start-up assessment tool has the same six dimensions, but adds a seventh dimension called business case. For both versions, each dimension is measured by scoring a number of statements on a scale from 1 (completely disagree) to 5 (completely agree). Each dimension has between 3 and 11 statements, so the number of statements varies for every dimension. After taking the average score for every dimension, a radar chart (Figure 3) is constructed, which is considered the result of the innovation assessment.

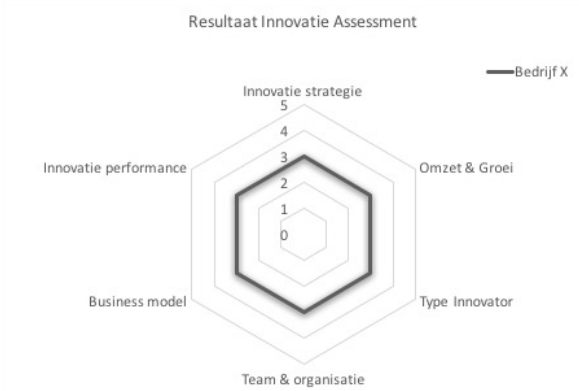


Figure 3: The Innovation Company Assessment Tool - Radar Chart for SMEs

When comparing The Innovation Company's assessment tool with the proposed tool, the first difference that can be identified is the categorization that is made in both tools. The proposed assessment tool uses the categorization introduced by Kahn et al. (2006), whereas The Innovation Company's tool uses six other dimensions of innovation, namely innovation strategy, revenue and growth, type of innovator, team and organization, business model, and innovation performance. Comparing this to Kahn et al.'s (2006) categorization, it can be concluded that only strategy is directly present in both tools. The Innovation Company's team and organization could be compared to the category called people from the proposed assessment tool, but is not exactly the same.

The second difference between the tools is the differentiation that is made within the tools. The Innovation Company differentiates between SMEs and start-ups, whereas the proposed assessment tool differentiates between incremental and radical innovation. This research did not specifically investigate whether best practices differ for SMEs and start-ups, but the reviewed literature did not make this differentiation. On the other hand, The Innovation Company's tool is lacking the differentiation between radical and incremental innovation, a differentiation that this research proves has important implications for best practices.

The third difference that is to be discussed is the way in which both tools assess innovativeness. The Innovation Company uses Likert scales to assess innovativeness within their six dimensions of innovation. The more an organization can identify with the mentioned statement, the higher it scores on that statement and according to The Innovation Company's tool, the higher its innovativeness. The proposed innovation tool, however, assesses innovativeness through offering different maturity stages within every KPA. Manager can then decide, based on the different statements within every maturity level, where their organization fits in the spectrum of that KPA.

The number of statements that are used to assess an organization's innovativeness can be considered a fourth difference. The proposed assessment tool has different numbers of statements within each maturity level, from the first to the fifth level of maturity respectively 55, 58, 71, 62, and 64 statements, creating a total number of 310 statements in the tool. This number leads to an average of 10.33 statements per maturity stage per category. The Innovation Company's assessment tool uses a total of 40 statements, which leads to an average of 6.67 statements to assess a dimension. Therefore, it can be argued that the proposed assessment tool includes more statements to measure a certain category, and in general includes more statements and best practices.

A fifth identified difference is the fact that the statements within the proposed assessment tool find their basis in existing literature, whereas this is unclear for The Innovation Company's tool. The practices of the proposed tool have their foundation in literature, whereas this might be debatable for The Innovation Company's assessment tool. The Innovation Company's tool includes practices that are a bit vague or difficult for managers to understand. An example is the statement: "A good organization exists to support the innovation team". If managers score their organization low on this statement, The Innovation Company's tool does not provide clear and implementable instructions on how to improve.

The proposed assessment tool has several advantages over The Innovation Company's tool. First of all, the tool includes a greater number of statements and thus assesses a wider variety of practices, making the tool more complete. Moreover, the proposed assessment tool's best practices can be traced back to existing literature, as cited in this research. This foundation in literature makes the tool more reliable, as it can back up the recommendations that the tool provides. Thirdly, the proposed assessment tool offers clear points of improvement when a firm is not situated within the fifth maturity stage, so when there is room for improvement. Managers can simply look at statements from next maturity stages and can this way easily identify which steps should be taken in order to enhance innovativeness and reach a next maturity stage within that specific category. Finally, the proposed assessment tool makes the differentiation between radical and incremental best practices. This way, managers focusing specifically on one type of innovation can specialize their organization's practices towards promotion of that type of innovation. As it was found that best practices are different for radical and incremental innovation, and not all SMEs pursue the same type of innovation, it is important to make this differentiation.

The Innovation Company's assessment tool also has advantages over the proposed assessment tool. First of all, managers of SMEs might consider the Likert scales of The Innovation

Company's tool easier to implement than the proposed assessment tool's maturity stages. Secondly, The Innovation Company's tool provides a quantified and visual representation of an SME's innovation process' performance in the form of a radar chart, whereas this visual presentation is only present in the proposed assessment tool through the maturity stages. The Innovation Company's tool could be improved by providing better instructions on how to improve a certain dimension, although it can be argued that The Innovation Company's consultancy is supposed to do that. Moreover, it is unclear whether The Innovation Company's tool is derived from a theoretical basis, or whether it is rather based on experience.

The Innovation Company's tool, however, should be careful with the use of some of their statements. The goal is to assess a firm's innovativeness, and some of the statements are not necessary relevant. Examples are statements such as "The organization prefers radical over incremental innovation" and "The organization operates from an open innovation model". This research proves that radical innovation does not have the same predictors and incremental innovation, and that one type of innovation is not necessary better for every organization. Moreover, open innovation is not beneficial in every case for every organization (Gassmann, 2006), so if a firm scores low in open innovation, it does not mean that it has low innovativeness; open innovation might simply not fit the organization.

Because The Innovation Company's assessment tool does not make the differentiation between certain types of innovation, some of their best practice statements can be considered incorrect. The statement about organizations preferring radical over incremental innovations implies that The Innovation Company's tool is more directed towards radical innovation, and the other statements should therefore match best practices for radical innovation. Nevertheless, a number of statements are directed towards stimulating stage-gating, which was proven to be ineffective in stimulating radical innovation, and more effective for incremental innovation. Moreover, one of the statements says that "the organization has a reward system for individual entrepreneurship and innovation", whereas the developed assessment tool states the opposite, saying that organizations desiring radical innovations should reward employees based on organizational performance to stimulate risk-taking.

Concluding this comparative analysis, it can be argued that both tools can be improved somehow. The proposed assessment tool can be improved by adding some type of visual representation of the results. Discussing The Innovation Company's tool, several points of improvement have been identified. Three main action points have been identified and are listed below:

1. Include more best practices in the assessment tool, especially ones that are proven in literature, to make the tool more reliable.
2. Improve suggestions and action points to improve for every statement, so it is easier for managers to improve their innovation process.
3. Within the assessment tool, make the differentiation between radical and incremental innovation. Best practices are different for these types of innovation and they should therefore be assessed differently.

Although points of improvement have been identified for both tools, it can be argued that their similarities allow for validation of both tools. The Innovation Company's tool has been used in practice and was successful, whereas the proposed innovation tool has been constructed from existing literature. The similarities in the design of both tools, in combination with the practical validation of The Innovation Company's tool and theoretical validation of the proposed tool, allows to conclude that both innovation assessment tools are valid.

7. IMPLICATIONS AND LIMITATIONS

7.1 Theoretical Implications

This research both has theoretical, as well as managerial implications. The managerial implications are greater, as this research is focused on developing a practical tool to enhance innovativeness and is thus practically oriented. However, the research also led to some theoretical contributions, which will be discussed now.

The analysis in Section 4 provides a theoretical contribution with the proposed innovation pentagon. The innovation pentagon combines several already existing dimensions of innovation and offers a new way to categorize and discuss innovations. Current typologies of innovations often only differentiate between two types of innovation, whereas the proposed innovation pentagon provides a way to categorize innovations in greater detail. Future research could use this new typology of innovations to ensure that innovations are categorized correctly.

Secondly, this research fills the gap in research of best practices for stimulating specifically radical or incremental innovation in SMEs. Previous research found best practices to stimulate a certain type of innovation, but this was often not tailored to SMEs. Moreover, the best practices that were found were often limited in number, whereas this research includes a greater number of best practices that were found to be predictors of a certain type of innovation.

Thirdly, this research expands on the model of Nicholas and Ledwith (2006), who adapted Kahn et al.'s (2006) model to SMEs. This research adds findings of other researchers to the framework, but also adds a new dimension with best practices that specifically promote either radical or incremental innovation. This dimension did not exist in the framework before, and can thus be considered added value.

7.2 Managerial Implications

The proposed innovation pentagon also has managerial implications, as it offers concrete examples for every dimension of innovation that is discussed and provides a new way for managers to discuss innovation. Not only researchers, but also managers can benefit from categorizing innovations better. The research helps managers to create a better understanding of the different types of innovation that exist and are discussed in literature.

What could be considered the most important managerial implication of this research is the proposed assessment tool for innovation, including best practices for SMEs. The tool can be used by managers of SMEs to assess in which maturity stage their organization is positioned with regards to several categories of the NPD process. Moreover, it offers recommendations to improve a firm's innovation process and move to a higher maturity stage, by providing statements within every maturity stage. The research also provides instructions for managers on how to implement these best practices specifically in SMEs, to ensure that managers are able to implement the recommendations. The assessment tool can be considered to be complete regarding the included best practices, as it uses an existing and inclusive framework as its foundation (Nicholas and Ledwith, 2006), includes Ernst's (2002) inclusive findings, and adds missing best practices from other literature. Therefore, it can be argued that the assessment tool for the innovation process of SMEs is complete.

Another practical implication of this research is the validation of The Innovation Company's assessment tool. Some criticisms of the tool have been provided, but in general it was found to be a valid tool to measure innovativeness. An action point list was constructed in order for The Innovation Company to easily recognize points of improvement.

Finally, the visual summarization of this research, as can be found in Figure 2, allows for a better understanding of managers of the concept of innovation and the assessment tool. It provides a visual overview of different dimensions of innovation and how the findings of this research can be used.

7.3 Limitations and Future Research

Although this research is conducted with great care, there are some limitations to the research. The first limitation is that the developed assessment tool is not tested in practice and the tool is thus not verified. By comparing the proposed tool to The Innovation Company's assessment tool, the design of the tool can be discussed, but its real effectiveness can only be assured by using the tool in practice. Future studies should test the tool in practice to ensure its validity.

Secondly, the effects of all described best practices combined are not tested. Previous research found the described practices to be best practices, but this combination of practices has never been tested and the effectiveness can therefore not be assured. For this reason, the tool needs to be tested in practice to see whether it successfully measures the extent to which best practices are followed, but also to see whether the combination of recommended best practices leads to enhanced innovativeness. Moreover, future research should test the tool on both start-ups and SMEs to check its applicability and relevance for both types of organizations. This research was specifically tailored towards SMEs, but the findings could also be used in start-ups.

A third limitation of this research is the lack of a visual representation of the SME's situation in the assessment tool. Managers of SMEs can visualize the process through marking the maturity stage the organization is situated in, and the maturity stage it wants to achieve, but a more effective visual representation is lacking. When comparing the assessment tool to The Innovation Company's tool, their way to visualize the situation was found to be an advantage over the proposed tool. Future research could focus on how the assessment tool can offer a more effective visual representation of the organization's situation.

Fourth, the assessment tool could be improved by including best practices that differ for the other dimensions of innovation that were identified. This way, managers of SMEs can position themselves in the innovation pentagon and then identify best practices from the assessment tool for the specific type of innovation process that is pursued. Currently, the only dimension that is included is the radicalness dimension, but future research should expand the model by including the other dimensions as well.

A fifth limitation is the limited number of examples that is provided with the dimensions of innovation. The goal of the examples is to construct a clear image of what a certain dimension of innovation means in practice, but the number of examples could have been greater to give a better picture of the dimensions.

Finally, this research is limited in the sense that it fails to include all dimensions of innovation in the proposed innovation pentagon, for example the dimension modular versus architectural innovation. The goal of the pentagon is to allow for a greater differentiation between innovations by providing multiple dimensions, but not all dimensions were included. The most relevant dimensions were chosen and included in the innovation pentagon, but other dimensions were excluded that might be relevant in some cases. These dimensions were excluded to keep the tool practical and relevant for SMEs.

8. CONCLUSION

The goal of this research was to provide an overview of different dimensions of innovation, and to develop a tool that helps managers of SMEs to assess the extent to which their organization fits best practices for innovation.

First, dimensions of innovation were discussed and examples were provided for every dimension, to create a better understanding of the types of innovation that exist. To be able to better differentiate between innovation types, the innovation pentagon was developed. The innovation pentagon is a model to describe innovation by ranking them on five different dimensions, which leads to a more detailed description of innovations. The dimensions that were used are radicalness, technicality, product relatedness, competence supportiveness, and newness to industry.

An assessment tool was developed to stimulate either radical or incremental innovation in SMEs. The tool uses Kahn et al.'s (2006) six categories of the NPD process: strategy, NPD process, performance evaluation, people, portfolio management, and market research. Moreover, it uses Nicholas and Ledwith's (2006) five maturity stages. The assessment tool can be used by managers of SMEs to successfully measure to what extent their organization follows best practices, and find out where most room for improvement is. The identified problem areas can then be improved by following the described best practices from higher maturity stages.

Finally, The Innovation Company's assessment tool was compared to the proposed assessment tool, and it was found that both tools are similar in how they measure best practices and both tools can be considered valid measures of the innovation process. Both tools have their own advantages, however, there is room for improvement for each tool. Therefore, an action point list was constructed in order for The Innovation Company to most effectively improve their assessment tool.

9. ACKNOWLEDGMENTS

I would like to thank dr. Matthias de Visser for his help during the whole process of writing this thesis. He was available for questions during the entire process and his honest feedback was of great value. Moreover, I want to thank The Innovation Company for their input in this research. The idea of writing the thesis for a real organization makes it that extra bit more exciting, and their feedback in the early stages helped to create the structure of this research. Finally, I would like to thank the other students whom I collaborated with in the same research circle, their continuous feedback and support helped me during the whole process of writing this research.

10. REFERENCES

Acs, Z.J., Audretsch, D.B. (1990). Innovation and Small Firms. *The MIT Press*.

Aiken, M., Hage, J. (1971). The Organic Organization and Innovation. *Sociology,* 5, pp. 63-82.

Alphabet Investor Relations. (2004). 2004 Founders' Letter. Retrieved June 20, 2017, from https://abc.xyz/investor/founders-letters/2004/

Apple UK and Ireland Public Relations. (2007). Apple Reinvents the Phone with iPhone. Retrieved May 15, 2017, from https://www.apple.com/uk/pr/library/2007/01/09Apple-Reinvents-the-Phone-with-iPhone.html?utm_content=buffer9ce8e&utm_medium=

social&utm_source=twitter.com&utm_campaign=buffer

Bantel, K., Jackson, S. (1989). Top management and innovations in banking: does the composition of the top team make a difference? *Strategic Management Journal*, 10, pp. 107-124.

Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. *Management Decision*, 47(8), pp. 1323-1339.

Brown, S.L., Eisenhardt, K.M. (1998). *Competing on the edge: strategy as structured chaos.* Boston: Harvard Business School Press.

Burns, T., Stalker, G.M. (1961). *The Management of Innovation,* London, Tavistock.

Cooper, R. G. (1990). Stage-gate systems: a new tool for managing new products. Business horizons, 33(3), pp. 44-54.

Damanpour, F. (1988). Innovation type, radicalness, and the adoption process. *Communication research*, *15*(5), pp. 545-567.

Damanpour, F. (1991). Organizational Innovation: Meta-Analysis of Effects of Determinants and Moderators. *Academy of Management Journal,* 34, pp. 555-590.

Damanpour, F., Walker, R.M., Avellaneda, C.N. (2009). Combinative Effects of Innovation Types and Organizational Performance: A Longitudinal Study of Service Organizations. *Journal of Management Studies,* 46(4), pp. 650-675.

Damanpour, F., Wischnevsky, J.D. (2006). Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. *Journal of Engineering and Technology Management,* 23, pp. 269-291.

Davenport, T.H. (1993). Process Innovation: Reengineering Work through Information Technology. *Harvard Business School Press*.

Department for Business Innovation and Skills. (2004). Community Innovation Survey 4.

Dewar, D.D., Dutton, J.E. (1986). The Adoption of Radical and Incremental Innovations: an Empirical Analysis. *Management Science,* 32(11), pp. 1422-1433.

Edquist, C., Hommen, L., McKelvey, M. (2001). Innovation and Employment: Process versus Product Innovation. *Cheltenham: Edward Elgar*

Elgan, M. (2011). How iPhone Changed the World. *Cult of Mac.* Retrieved May 15, 2017, from http://www.cultofmac.com/103229/how-iphone-changed-the-world/.

Ernst, H. (2002). Success factors of new product development: a review of the empirical literature. International Journal of Management Reviews, 4(1), pp. 1-40.

Ettlie, J.E., Bridges, W.P., O'Keefe, R.D. (1984). Organization Strategy and Structural Differences for Radical versus Incremental Innovation. *Management Science*, 30(6), pp. 682-695.

Fink, A. (1998). Conducting research literature review: from paper to internet. *Thousand Oaks: SagePublications*.

Ford. 2013. Game Changer: 100th Anniversary of Moving Assembly Line. *Ford Media Center.* Retrieved May 15, 2017, from https://media.ford.com/content/fordmedia/fna/us/en/features/game-changer--100th-anniversary-of-the-moving-assembly-line.html

Frambach, R.T. Schillewaert, N. (2002). Organizational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of Business Research*, 55. pp. 163-176.

Galbraith, J.R. (1982). Designing the innovating organization. *Organizational Dynamics*, 10(3), pp. 5-25.

Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R&D Management, 36*(3), pp. 223-228.

Germain, R. (1996). The Role of Context and Structure in Radical and Incremental Logistics Innovation Adoption. *Journal of Business Research*, 35, pp. 117-127.

Gillette. (2017). All Razors. Retrieved June 20, 2017, from https://gillette.com/en-us/products/razors-trimmers-and-blades/all-razors#viewtype:gridview/facets:/category:all-razors/page:1/sortby:Featured Sort/productsdisplayed:undefined/cwidth:3/promotilesenabled:false/pcwidth:/cwidth:3/pscroll:

Griffin-Smith, I. (2016). Innovation at Dyson: The Art of Reimagining the Mundane. Retrieved June 20, 2017, from https://theleadershipnetwork.com/article/innovation-management/innovation-dyson-reimagining-appliances

Hult, G.T.M., Hurley, R.F., Knight, G.A. (2004). Innovativeness: Its antecedents and impact on business performance. *Industrial Marketing Management*, 33, pp. 429-438.

Jiménez-Jiménez, D., Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of Business Research*, 64, pp. 408-417.

Kahn, K.B., Barczak, G., Moss, R. (2006). Establishing an NPD Best Practices Framework. *The Journal of Product Innovation Management*, 23, pp. 106-116.

Kimberly, J.R., Evanisko, M.J. (1981). Organizational Innovation: The Influence of Individual, Organizational, and Contextual Factors on Hospital Adoption of Technological and Administrative Innovations. *Academy of Management Journal,* 24, pp. 689-713.

Koberg, C.S., Detienne, D.R., Heppard, K.A. (2002). An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation. *The Journal of High Technology Management Research*, 40, pp. 21-45.

Koen, P. A. (2004). The fuzzy front end for incremental, platform and breakthrough products and services. PDMA Handbook, pp. 81-91.

The Innovation Company. (2017). Innovatie assessment. Retrieved May 11, 2017, from http://www.The Innovation Company.nl/en/subsidie/embedded-consultancy/.

Lee, D. (2016). CES 2016: Hands-on with LG's roll-up flexible screen. Retrieved June 20, 2017, from http://www.bbc.com/news/technology-35230043.

Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*.

Magnusson, T., Lindström, G., & Berggren, C. (2003). Architectural or modular innovation? Managing discontinuous product development in response to challenging environmental performance targets. *International Journal of Innovation Management*, *7*(01), pp. 1-26.

Meeus, M.T.H., Edquist, C. (2006). 'Introduction to Part I: Product and process innovation'. In Hage, J., Meeus, M. (Eds), Innovation, Science, and Institutional Change. *Oxford: Oxford University Press*, pp. 23-37.

Mui, C. (2012). How Kodak Failed. Retrieved June 20, 2017, from https://www.forbes.com/sites/chunkamui/2012/01/18/how-kodak-failed/#695ac84c6f27

Nahapiet, J., Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review,* 23, pp. 242-266.

Nicholas, J., & Ledwith, A. (2006). Development of a best practices framework for new product development in small to medium enterprises.

Nord, W.R., Tucker, S. (1987). *Implementing routine and radical innovations*. Lexington, MA: Lexington Books.

Papinniemi, J. (1999). Creating a model of process innovation for reengineering of business and manufacturing. *International Journal of Production Economics*, *60*, pp. 95-101.

Paulk, M. C., Curtis, B., Chrissis, M. B., & Weber, C. V. (1993). Capability maturity model, version 1.1. IEEE software, 10(4), pp. 18-27.

Product Development Management Association (PDMA). (2005). What is the NPDP Certification Exam?. Retrieved June 26, 2017, from http://www.pdma.org/certification/what_is_certification_exam.php.

Schilling, M.A. (2013). Strategic Management of Technological Innovation. *McGraw-Hill Education*, International Edition, 4th Edition.

Schultz, T.W. (1961). Investment in human capital. *American Economic Review*, 51, pp. 1-17.

Scott, S., Bruce, R. (1994). Determinants of innovative behavior: a path model of individual innovation in the workplace. *Academy of Management Journal*, 37(3), pp. 580-607.

Sethi, R., & Iqbal, Z. (2008). Stage-gate controls, learning failure, and adverse effect on novel new products. Journal of Marketing, 72(1), pp. 118-134.

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. Journal of cleaner production, 16(15), pp. 1699-1710.

Smith, K.G., Gupta, A., Shalley, C. (2006) The interplay between exploration and exploitation. *Academy of Management Journal,* 49, pp. 693-706.

Spender, J.C., Kessler, E.H. (1995). The science of complexity: an alternative perspective for change processes. *Strategic Management Journal*, 16, pp. 477-495.

Stein, B.A., Kanter, R.M. (1980). Building the parallel organization: Creating mechanisms for permanent duality of work life. *Journal of Business*, 40, pp. 497-510.

Stewart, D. W., & Kamins, M. A. (1993). *Secondary research: Information sources and methods* (Vol. 4). Sage.

Subramanian, A., & Nilakanta, S. (1996). Organizational innovativeness: exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega*, *24*(6), pp. 631-647.

Subramaniam, M., Youndt, M.A. (2005). The Influence of Intellectual Capital on the Types of Innovative Capabilities. *Academy of Management Journal,* 48(3), pp. 450-463.

Team, T. (2015). How NIKEiD Is Helping Nike's Push For Greater Profits. Retrieved June 20, 2017, from https://www.forbes.com/sites/greatspeculations/2015/07/09/how-nikeid-is-helping-nikes-push-for-greater-profits/#1939e2074e65

Thompson, V.A. (1965). Bureaucracy and Innovation. *Administrative Science Quarterly*, 10(1), pp. 1-20.

Tibken, S. (2017). 10 ways the iPhone changed everything. *CNet News*. Retrieved May 15, 2017, from https://www.cnet.com/news/apple-iphone-steve-jobs-10-ways-everything-changed/

Titcomb, J. (2017). 10 ways the iPhone changed the world. *The Telegraph*. Retrieved May 15, 2017, from http://www.telegraph.co.uk/technology/2017/01/08/iphone-turns-10-10-ways-changed-world/

Un, C.A. (2010). An empirical multi-level analysis for achieving balance between incremental and radical innovations. *Journal of Engineering and Technology Management,* 27, pp. 1-19.

Utterback, J. M., & Abernathy, W. J. (1975). A dynamic model of process and product innovation. *Omega*, *3*(6), pp. 639-656.

Van de Ven, A.H. (1986). Central Problems in the Management of Innovation. *Management Science*, 32(5), pp. 590-607.

West, A.W., Anderson, N.R. (1996). Innovation in Top Management Teams. *Journal of Applied Psychology*, 81(6), pp. 680-693.

Wiersema, M.F., Bantel, K.A. (1992). Top management team demography and corporate strategic change. *Academy of Management Journal*, 35, pp. 91-121.

Wong, A., Tjosvold, D., Liu, C. (2009). Innovation by Teams in Shanghai, China: Cooperative Goals for Group Confidence and Persistence. *British Journal of Management*, 20, pp. 238-251.

Ylinenpää, H. (1998). Measures to Overcome Barriers to Innovation in Sweden – Fits and Misfits