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Article

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Analysis of innovation management in German enterprises

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Abstract: In the drive towards economic globalization, companies are faced with both opportunities and challenges. As the global landscape changes, company and by extension countries increasingly grasp the level of importance innovation has to their survival and continued development. The element of innovation, within the business environment, has become the necessary condition for sustainable development of a country or nation. In the case of Germany, the authors acknowledge the country's fascinating ability in innovation management; therefore have sought to gain a better understanding through a sampled analysis of German private enterprises. In the process, quantitative model and qualitative model were utilized together. On the one hand, a qualitative method is adopted to collect primary data. On the other hand, a quantitative process is used to collect secondary data. According to the data analysis of the sampled corporations and businesses, the indices of each factor vary across the different industries. Results also suggested that stronger enterprises give greater attention to innovation (factors) and therefore reap higher gains. In such companies, various rules and regulations are designed to stimulate the employees' creativity; while communication is established across all parts of companies. Similarly, the company would be design on the basis of adapting different market strategies. Worthy of note is that companies in each industry

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PUBLIC INTEREST STATEMENT

With the increasing recognition given to innovation and its fundamental importance to the survival of companies within a global environment, the authors thought it necessary to provide an empirical evaluation of the firm's perspective regarding its impact on daily operations. This impact on business activity is noted at various levels; from the level of national policy to the company's decision-making and scope.

Through the evaluation of various German companies, recognized for their abilities to effectively manage the process of innovation and rendering them effective sources to learn from, it was determined that the elements of innovation vary across the different industries. It was also evident that greater attention to innovation management fosters higher returns—emphasizing its significance. The results therefore stressed the need for companies across the global marketplace to meaningfully consider the connectivity of the innovation process truly seeking to strengthen the company's management structure to competitive level.

treat technological innovation as an important element to their development. Such emphasis on the importance of innovation management is a vital factor that can aid in explaining why German enterprises have gained such success to date. Hence, companies in other world economies, including fast pace China should take note of the German companies and strengthen their own management structure regarding innovation.

Subjects: Economics; Finance; Business & Industry; Innovation Management; Management of Technology & Innovation

Keywords: innovation; innovation strategy; German enterprise; managing innovation; innovation elements

1. Introduction

For any business globalization has not only brought challenges, it has also presented a number of opportunities. In today's business climate, companies are seeking to exploit all avenues presented, as they fight to overcome future challenges of a dynamic business environment. Innovation provides such avenues. The element of innovation, within the business environment, has become the necessary condition for sustainable development of a country or nation. Essentially, companies who are unable to innovate and reform rest on the verge of extinction. Fundamentally, the available literature suggests that innovation is to break the company's own limitations and rid itself of timeworn systems. Moreover, under the existing conditions, innovation requires creating new models and initiatives in order to thrive within the fierce competitive marketplace.

The notion of innovation and innovation management has long been rivaled, both in utility and definition. Most research is based on the 1930 works of Joseph A. Schumpeter, an Austrian economist who recognized the useful nature of innovation (Scocco, 2006). A number of authors (Afuah, 1998; Galindo & Méndez-Picazo, 2013; Pedersen & Dalum, 2004; Rogers, 1983, etc.) have focused their research on aspects of innovation closely related to the innovative goods or services offered to the customer as well as to the (innovation) process. However, the authors have found that following the definitions offered by Edison, Bin Ali, and Torkar (2013) and Idris Mootee (2013) to be most appropriate for the focus of this research:

> Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome. (Edison et al., 2013)

> Innovation Management is about more than just planning new products, services, brand extensions, or technology inventions. It's about imagining, mobilizing, and competing in new ways. (Mootee, 2013)

According to the Word Development Indicator for 2014 (World Bank, 2014), Germany remains the largest national economy within the Euro area, occupying the fourth largest nominal Gross Domestic Product (GDP) in the world, in 2013. Following its period of industrialization, the country has been an innovator and one of the key drivers of global growth. According to Breitschopf and Grupp (2004), the foreign trade success that the German technology sector enjoys is primarily based on the automobile sector. Dominated by the vehicle manufacturing industry, the trade sector is characterized by strong innovation dynamics. Despite its prominent position, suppliers in the industry play a critical role in its success. Thus, the need for constant cutting-edge performances across the entire German landscape cannot be understated (Preissl & Solimene, 2003).

Records also indicate that Germany is the world's third largest exporting country (US$1.70 billion) for 2013. In 2014, The Germany Federal Statistical Office announced that the country reached a

trade surplus high of €198.9 billion (US$269 billion), making it the biggest capital exporter, globally. What's more, innovation has played an important role in German enterprises. German investment into research and development (R&D) of 2.9% of GDP stands above all other European countries (World Bank, 2014). In 2014, Germany ranked ninth on the Global Innovation Index (GII) (The Knowledge Group, 2015) and fifth (third amongst European nations) on the Global Competitiveness Index 2014–2015 (World Economic Forum, 2015). In 2013, German individuals/companies submitted 47,353 patent applications, representing 43.6% of all European companies, and the largest source across the continent. In a recent article, Aghion, Howitt, and Prantl (2015) provide empirical proof that patent protection fosters innovation.

The process and management is not without its own challenges; several of which private companies are likely to face. Firstly, not all private companies are willing to implement the required innovative management procedures, especially the "old-guard" companies. Companies that fit comfortably into the existing model and find the possibility of learning a new way inherently time consuming and therefore not worth the effort. Further, it can sometimes become a daunting task when attempting to persuade staff to cooperate with a company's new direction. Innovation is simply not suited to all industries, thereby leaving no other option but to remain with to maintain the inherent model.

Secondly, it is quite difficult for small and medium-sized enterprises (SMEs) to innovate or accommodate appropriate innovation management structures. As SMEs, the adequate financial capital required for investing in R&D can be quite difficult to obtain. In the situation where financial support is not an obstacle to overcome, it is understood that innovation investments may not have any immediate and obvious impact; that is, innovation and innovation management are long-term ventures with no real rapid reward. This provides an argument for some SMEs to resist parting with any existing system.

Third, consideration of union positions (as existing in Germany), which argues that innovation management may affect the best interests of some people, should be of note. A new system will get a new result which is not as good to all affected. This provides another difficult factor for the private companies to conquer.

Across the literature, it is broadly accepted that innovation is key to the economic performance and growth in firms (Galindo & Méndez-Picazo, 2013; Kleinschmidt & Cooper, 1995). A common message is that all businesses must look ahead with a competitive focus, and in doing so, innovate. This requires a whole new shift in management style and structure, thus the relevance of innovation management. With the 2008/09 recession in the not too distant past, countries in the world remain in challenging situation; the authors acknowledge Germany's fascinating ability to successfully implement innovation management procedure. Therefore, in addition to a brief review of some existing work, this research seeks to gain a better understanding of innovation management through an analysis of sampled German private enterprises.

2. Review of literature

Innovation has become the buzzword of a time marked by rapid technological change (Wagner, 2008). In the world of business where management is regarded as the cornerstone to the development process, innovation is the substance of management. According to authors, Birkinshaw, Hamel, and Mol (2008), as economies continued to develop the business environment acknowledges that innovation management is a necessary condition for companies to reach success. Rothwell (1992) emphasizes that management can be the driving force for major initiatives, and support may be an empowerment tool for staff to overcome internal resistance to an organization's innovativeness. In 1987, Gobeli and Brown (1987) observe that top management support accounts for improved feasibility of radical innovations over incrementally improved products; noting that this type of support has an ability to also endanger the innovation process. These findings add to the validity of the works by Rubenstein, Chakrabarti, OKeefe, Souder, and Young (1976) and Kleinschmidt and

Cooper (1995) that excessive involvement of management can lead to failure as often as it leads to success within an innovative environment.

In 2007, Hansen and Birkinshaw maintained that there is no universal solution for improving innovation in organizations. The authors concluded that management needs to take an all-inclusive look of their innovation efforts, identify any perceived weaknesses, and modify best innovation practices to address the deficiencies (Hansen & Birkinshaw, 2007).

Prather (2010) later settles that the human element is critical in the innovation process, but need to be placed within the right environment. It was also the work of Chen and Huang (2009) that suggests, for a company to create the right innovative environment, management is required to develop appropriate policies and practices with respect to people. Increased employee participation creates an environment that encourages employees to bring new ideas and exchange creative thoughts throughout the innovation process that enhances the overall outcomes (Chen & Huang, 2009).

Innovative firms are regarded with greater uncertainty and variability, therefore making it essential to recruit, train, and keep employees who are flexible, risk takers, tolerant of uncertainty and ambiguity (Chen & Huang, 2009). According to Brenner (1994) innovation projects demand long-term commitment (Brenner, 1994).

Garnier (2008) argued that better results are gained if power is given to the researchers (R&D), insisting that focused groups headed by leaders in the scientific field can be of greater inspiration and guidance. The author used the experience of GSK, where the organizational pyramid was collapsed into a constellation of highly focused centers of excellence, increased the speed of decision-making, and restore autonomy to scientists actually conducting the research. However, earlier works by Hamel and Getz (2004) insisted that companies need to institutionalize innovation as a core value. Arguing that ideas can come from anywhere within the company, not just R&D personnel.

Developing an innovative culture is much more than offering a prize for innovative behavior. Thompson and Heron's (2006) research looked at links between three dimensions of the employment relationship—the psychological contract, affective commitment, and knowledge-sharing behaviors—and their consequences for innovative performance. Their finding indicates that companies investing heavily in socialization of employees, and policies, standards and practices to forge strong personal identification with the organization, its values and purpose may be better placed to extract success from workers. Hamel and Getz (2004) also recommend that a company should commit itself to a relatively small number of medium-term innovation goals, while measuring how persistent the company pursues success. The key is to have goals that are big enough to be compelling, yet practical enough to be credible; goals should be broad enough to invite contributions from across the firm and beyond, yet specific enough to provide focus. They should have the power to multiply individual efforts (Hamel & Getz, 2004).

3. Methodology

The approach we utilized in this research is a mixed-method of two phases. During the first phase, we conducted secondary data collection including both quantitative and qualitative data. In second phase we collected primary data.

3.1. Sampling frame and size

Sampling frame is all German enterprises. In this research, we aimed to have data from at least 50 German enterprises. We decided to stop sending questionnaire to the selected enterprises as soon as we receive 50 responses from them. We sent questionnaire to 82 samples and received 50 responses.

For sample selection, we applied a Stratified sample selection technique. First we divided industries into 9 strata as follows: 1-Automotive manufacturing, 2-Logistics, 3-Retail, 4-Financial,

5-Electronics, 6-Biological and Pharmaceutical, 7-energy and Resources, 8-Chemical, 9-Manufacturing Engineering and machinery. We then used non-probability sampling to select enterprises from each strata.

3.2. Data sources

Our data sources in this research are: Participants from enterprises, peer-reviewed journals, reports, and selected enterprise's official website.

3.3. Tools

We adapt the Arthur D Little 8th innovation excellence survey-2012 questionnaire and revised it with focus on innovation strategy.

3.4. Data collection

Primary data collection was conducted by Ms. Lyu Yihui. She found related contact person in each enterprise then emailed them e-copy of the questionnaire. This data collection process took about 4 months to receive the 50th response. Also we collected data from companies' official website for basic information gathering.

4. Findings

The results we found are focused on enterprise capabilities regarding Innovation Management elements in the enterprises. Likewise, we collected data on the current strategic importance of the innovation management in the industries outlined.

Figure 1 illustrates that most of selected enterprise believe their capabilites for innovation is above average within the industry.

This diagram shows only 10% of selected enterprises think the importance of the innovation is average but about 30 and 58% believe it is important and very important, repectively. Technology, philosophy, and culture are considered very important innovations followed by organization and institutional innovation.

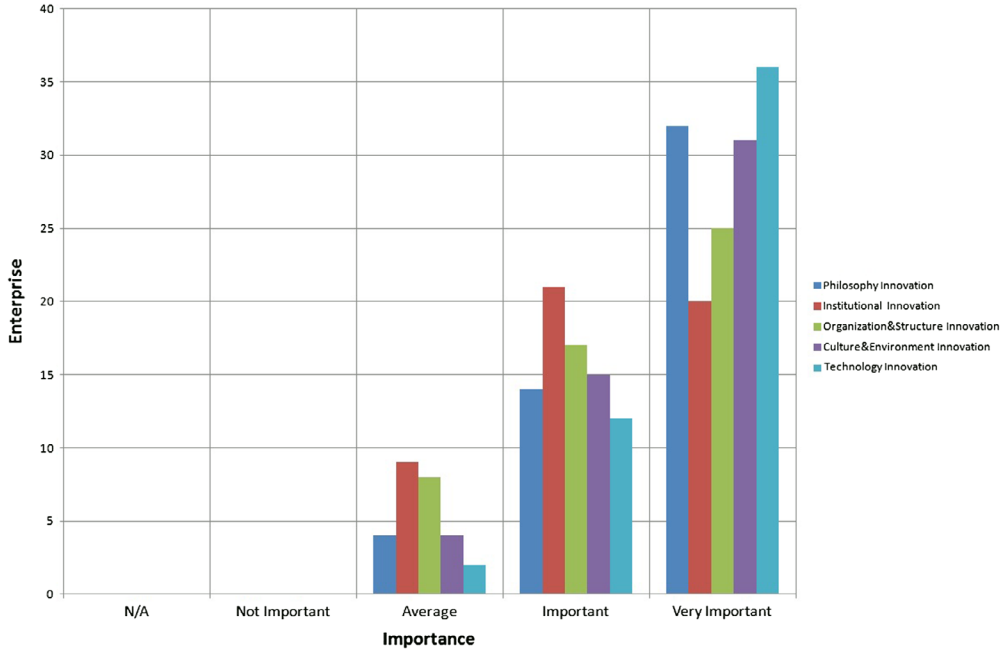

Figure 1. Strategic importance of innovation.

Figure 2. Enterprises' relative capabilities compared to peers.

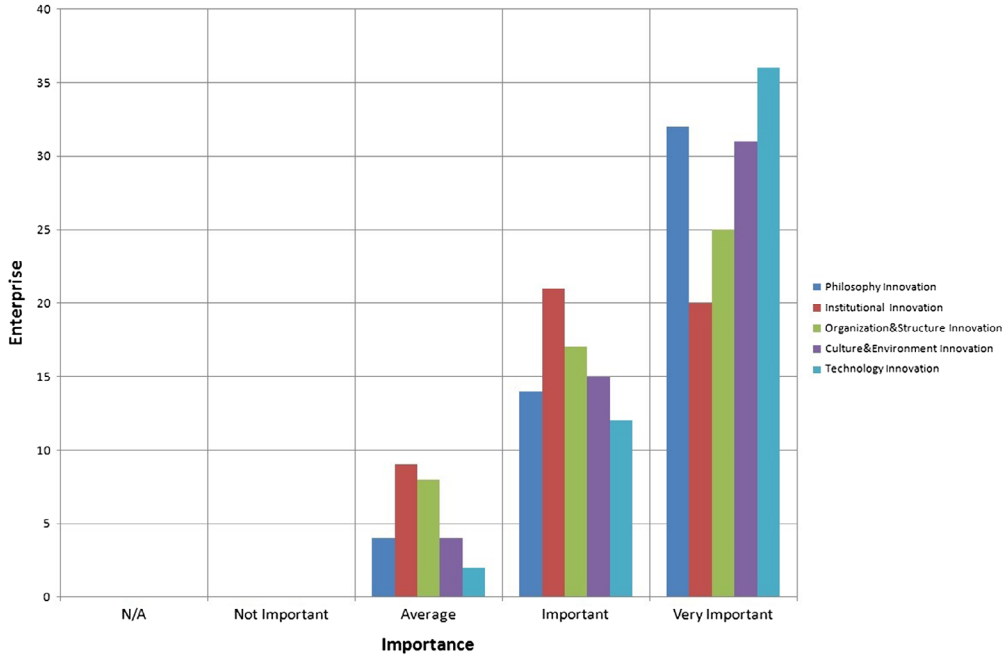

Figure 2 exhibits that 31% of enterprises think their capabilities regarding the innovation elements (Philosophy, Institutional, Organization & Structure, Culture & Environment, and Technology) is above average level, while about 69% of them believe they are among top 25% of industry when it comes to innovation. According to Figure 2 companies think their capacity covers five element similarly.

In the following, we introduce summary of data collected from 50 enterprises in Table 1. This table exhibits, detailed facts regarding philosophy, institutional, organization & structure, culture & environment, and technology innovation in response to their applicability in the enterprises in five scales (doesn't apply, applies in minority of cases, applies to an average extend, applies to a large extend, and applies completely).

We proceed with describing findings in each sectors of German industry.

4.1. Automotive manufacturing industry

Results of the survey provides evidence which shows the importance of management innovation in the automotive manufacturing industry; divided into five factors. Noticeably, 100% of the automotive companies consider philosophy innovation strategy to be very important. Regarding institutional innovation, an excess of 60% of companies treat it as an important factor, while approximately 30% classifies it is very important. Additionally, indications are that all the automotive enterprises are willing to set beneficial rules to create innovation and adopt various kinds of innovation strategies on the basis of different market strategies. In addition, all automotive companies have opinions about changing organizational structures in order to gain more profits; what's more, two-thirds among them assume this activity to be a very important element. Moreover, all of the same companies have high consideration regarding the elements of culture and environment innovations, all of which deem it very important to their development. Technology innovation also plays a significant role in the innovation management process. Finally, all surveyed automotive enterprises assert this type of innovation to be a very important portion, thus, they all offer strongly.

4.2. Logistics industry

Analysis of the surveyed data reveals how companies within the logistics industry evaluate the importance of management innovation under five elements. Firstly, all the logistics companies

Table 1. Summary of 50 German enterprise responses to the questionnaire

	Doesn't	Minority	Average	Large extend	Completely
To what extent do the following statements apply to your philosophy innovation?					
Philosophy innovation					
Innovation goals and objectives are set within the Corporate/ Business unit strategy			2	16	32
There is a cross-functional innovation steering group at corporate level			13	24	13
Innovation strategy is cascaded and communicated across all parts of the company		3	13	27	7
Institutional innovation					
The rules and regulations are beneficial for the staff to stimulate creativity			6	17	27
The company adjusts and designs various operation management systems on the basis of different market			11	18	21
The company pays attention to many-sided innovation (property system, operation system, management system, etc.)		1	12	21	16
To what extent do the following statements apply to your organization and structure innovation?					
Organization & structure innovation					
The company tries to adjust the division of labor or cooperation mode to gain higher efficiency			9	20	21
The company tries to change the responsibility relationship to increase the organizational effectiveness			10	22	18
The staff can adapt to the new organizational structure		1	7	25	17
To what extent do the following statements apply to your culture and environment innovation?					
Culture & environment innovation					
Laws and administrative regulations have a significant influence on innovation activities			4	16	30
The enterprise encourages the staff to communicate with other companies and organizations		1	12	24	13
The changes of market demand have a significant influence on innovation activities			7	16	27
To what extent do the following statements apply to your technology innovation?					
Technology innovation					
Technical factors (new technology, R&D, etc.) have a significant influence on operation activities			3	13	34
Technology innovations lay the foundation for long-term development		1	7	20	22
The company strongly supports the technology innovation			4	14	32

consider philosophy innovation as an very important factor. The data imply that companies assume it useful to set goals and objectives regarding institutional innovation, with 80% in full compliance. For institutional innovation, over 60% of enterprises regard it as an important factor, while more than 30% think it to be very important to their operation and management. Also indicated is that logistic enterprises place great focus on organization and structure innovation; half of the companies surveyed deem it is important, while another half assert it as a very important element. Remarkably, in the logistics industry, culture and environment innovation is absolutely a vital factor, as 100% suggested it to be a very important element to their development. From technology innovation perspective, it is made aware that 100% of the enterprises estimate that laws and regulations to have a significant influence on innovation activities. For the foregoing companies, an excess of 80% of logistic enterprises consider technology innovation as the very important element, thereby being strong supporters.

4.3. Retail industry

In the retail industry, responses of the survey illustrate the level of importance held by companies regarding management innovation, which is analyzed under five broad categories. Primarily, German retail companies consider philosophy innovation to play a crucial role in management. Approximately 60% of them believe it is very important, while the remaining 40% is held in higher regard. Alternatively, only 20% of the retail industry fails to hold institutional innovation with much importance, while 40% of them deem institutional innovation to be both important and very important to their development. Under the element of organization and structure innovation, 60% of the enterprises are in favor while 20% of the companies consider this type of innovation as average, and the other 20% as a very important factor. Moreover, 60% of the enterprises rendered cultural and environmental innovation as very important, while 20% of the firms separately treat it as an average or important factor. Additionally, companies assume laws and administrative regulations have a significant influence on innovation activities. Technology innovation still plays an important role as nearly 60% of retail companies provided very strong support for technology innovation.

4.4. Financial industry

Evidence from the survey also provides insight into how the financial companies evaluate the total management innovation importance. First, philosophy innovation is seen to play a vital role in innovation management. Data suggest that one-fifth of these companies treat it as an important factor while the other 80% believes it to be very important. When talking about institutional innovation, the data show that 60% of enterprises accepts it is very important, while the remaining 40% holds it in slightly less regard to their operation and management. The financial industry's general opinion about organization and structure innovation suggests that 60% consider it as the very important element while the remainder also see it as important to their operations. Futhermore, in the financial industry, culture and environment innovation is also seen as a crucial factor, 60% of the companies consider it as an important factor while the other 40% reckon it to be of greater importance. Interestingly, the technology innovation appears to be less impactful, only 20% of enterprises deem it is very important while 40% of the companies consider it as an average or just important factor.

4.5. Electronic industry

All surveyed companies within the electronic industry hold the belief that philosophy innovation plays a crucial role in management. Specifically, 80% of them reckon it to be very important, while 20% of them treat it as an important element. Regarding institutional innovation, the index is distributed irregularly such that 20% of the financial corporations do not assume it to be of much importance. On the contrast, 40% of the electronic industry considers institutional innovation as very important and another 40% as important. Additionally, 20% of the electronic companies treat organization and structure innovation as a very important element, while the remaining 40% see it as less important. Sixty percent of the enterprises adopt culture and environment innovation as a very important element, while the other 40% think it is important. However, under the cultural and environmental innovation assessment, 20% of electronic corporations do not encourage the staff to communicate with other companies and organizations actively; this is applied in minority cases. The data conclude that all electronic companies treat technology innovation as a very important factor to the management system.

4.6. Biological and pharmaceutical industry

Under total management innovation, companies in the biological and pharmaceutical industry evaluate the importance of management innovation within the five elements. Primarily, over 20% of companies of the industry consider philosophy innovation as an important element while less than 80% deem it as very important. Interestingly, the perspective of institutional innovation, organization and structure innovation, and culture and environment innovation among companies are the same. Within these three categories, 50% of the companies view them to be a very important element, despite having various meanings. An assessment of institutional innovation indicates that an excess of 70% of biological and pharmaceutical enterprises design various operation management

systems on the basis of different market strategies. While under the umbrella of organizational and structural innovation, staff can adapt to the new organizational structure quickly within the industry. Most corporations fail to regard laws and regulations with a significantly high importance, as one out of every five companies complied completely. In addition to all the foregoing, technology innovation is absolutely in the spotlight, the full list of biological and pharmaceutical companies reviewed, highlight it as a very important factor, thus offering strong support.

4.7. Energy and resource industry

Results from the Energy and Resource industry give an indication of how these companies view the importance of management innovation. Within the industry, philosophy innovation plays a significant role in innovation management, that is, one-quarter of the companies treat it as a very important factor while three of every four revere it as an important element. For institutional innovation, 50% of the enterprises assert it is important while 25% of the companies consider it as an average, and the remaining 25% as a very important factor. Moreover, half of the enterprises think culture and environment innovation is very important while another half of the firms treat it as important to their development and management. Most of them realize the importance of laws and regulations and apply completely. Noticeably, technology innovation is so important to the enterprises of energy and resource industry that all the companies choose a status of very important to their operations.

4.8. Chemical industry

Within the chemical industry, all companies indicated philosophy innovation as having a crucial role in management. One-third of them reckon it is important, while the remaining two-third sees it as a very important element. Surrounding institutional innovation, 50% of the enterprises assert it to be important while 25% consider it as very important; the remaining companies' impression is merely an average role. For organization and structure innovation, half of the companies consider it as an important element, whereas the other half stresses it to be of greater importance. Moreover, consideration given to culture and environment innovations suggests that above 80% of the industry deem it as very important to their development while less than 20% indicated a lower level importance. Additionally, results of the survey advocate that companies in the chemical industry realize the importance of laws and regulations, with two-thirds supporting total compliance. Lastly, technology innovation is seen as a high-valued component.

4.9. Manufacturing engineering and machinery industry

More than a half of manufacturing engineer and machinery industry supports a very important role for philosophy innovation strategy, while 25% assigns an average status. Under institutional innovation, exactly 50% of the corporations treat it as a very important factor, while less than 20% have an average perspective. Under the organizational and structural innovation assessment, approximately 60% of the manufacturing engineer and machinery enterprises are willing to set beneficial rules to create innovation and adopt various kinds of strategies on the basis of different market. In addition, these companies have opinions about changing organizational structures in order to gain more profits such that nearly 70% regard it as a very important element, while about 17% consider it as an important or average factor. Worthy of note, nearly 90% of the enterprises assume culture and environment innovation as very important, while less than 10% holds an average view. In addition to all the foregoing, all of the manufacturing engineer and machinery companies treat technology innovation as important factor with strong support.

5. Discussion, recommendation, and conclusion

5.1. Automotive manufacturing industry

Findings from this research suggest that companies in automotive manufacturing industry perform perfectly in innovation management. However, as previously expound in research done by FHDW

and later highlighted by German media, Volkswagen, Daimler, BMW, and Toyota remain the pioneers in automotive technology research and development; thus it holds that the German automotive manufactures' spirit for innovation is amongst the best. It is clear that all automotive enterprises reckon the three indexes are very important, offering their 100% endorsement. Additionally, complete attention is paid to these three forms of innovation.

Companies treat philosophy innovation as a very important factor, not only in the design of goals and objectives for the business, but also communicated across all parts of the company. This results in a thorough understanding of the strategies and spirits of the corporation.

Within the industry, culture and environment innovation is also considered very important, indicated again by 100% of the companies' support. To automotive manufacturing industry, laws and administrative regulations are vital to their operation, thus, compelling them to obey the local rules, and change various strategies due to the different market demand. In other results, technology innovation plays an important role, companies stress its significant influences on operational activities; as a consequence, they have supported technology innovation in an effort to develop new products and gain greater profits.

5.2. Logistics industry

Germany, with its highly dense transportation network, may be regarded as having one of the most developed logistical industries in the world. The density of its roads and railways are twice the average in all of Europe, containing a logistics park in every metropolis.

Worthy of note is that all automotive enterprises consider philosophy innovation and culture and environment innovation and, laws and administrative regulations as having important roles to play within the company's operation. Thus, indicating a level of obedience to the local rules and efforts to change various strategies due to the different market demand. Remarkably, technology innovation is of great significance to logistics industry; thus all companies support technology innovation, suggesting only advanced theories and technology can promote and gain a competitive advantage. Using Deutsche post (DPWN) as an example and one of the largest logistics service providers in the world, DPWN owns DHL, deutsche pos,t and the post bank. Ranked one of the world's largest multinational companies by number of employee count, DPWN employs approximately 520,000 employees in over 200 countries. Moreover, the logistics industry has become the third largest industry and an important pillar to the German economy.

5.3. Retail industry

In the retail industry, it is possible for organizations to improve their operation and the structure of different consumer segmentation through innovation. Empirical actions across the globe has shown without question that despite the type of industry consumers are crucial to success of revenue generation—i.e. the success of a business. Therefore, among the five evaluated factors, most companies counted management innovation as quite an important factor. Within this industry, data suggest that philosophy innovation is quite important to retailers, while performing well in the design of innovation goals and objectives; thoroughly understanding the strategies and spirits of the corporation. Regarding culture and environment innovation, companies expressed their view of laws and regulations with changes in strategy according to the customers' needs. Frequent changes in market demand and customers' needs force the retailer to adapt, improve, or innovate accordingly. This is done without going outside the confines of local laws and rules.

In a well-developed international retail company such as Metro, Wella (acquired by P&G), innovation input occupies a large portion of the company's revenue. As such, paying significant attention to technological innovation, only a small number of them can successfully improve on existing technology. Both internal and external factors influence the innovation strategy and idea management.

Arcandor, once the industry leader in retail, fell into bankruptcy, which was caused by the impact of electronic commerce. More and more brands have chosen to open its own stores, becoming independent of other retailers in the market. The vertical management of international brands store such as Apple and Zara can better present the brand image, but simultaneously reducing the intermediate links costs, and becoming ultimately more competitive.

5.4. Financial industry

Extrapolated from the industry survey is the realization that financial companies have different ideas of management innovation. First, they treat philosophy innovation as a greatly important factor, which they incorporate, to a large extent, into the innovation goals and objective designs of the business; while communicating across all departments. For the financial industry, institutional innovation and organization & environment innovation are held with higher importance than technology innovation. In addition, the average financial company will set various rules and regulations in efforts to stimulate the creativity of staff.

Regarding technology innovation, companies hold varying ideas of it. In a given example, Allianz pay noticeable attention to their technology innovation, as this may differ from the practices of other fanancial companies; by investing their money into the product and the service. The technology of Allianz is such that the company can separate continuous service improvement from new service development. With its individual value higher than the average. 40% suggests that the local product update and maintence teams are in place to meet local customer needs.

5.5. Electronic industry

In the electronic industry, there are four major German companies—Vector Informatik, Infineon Technologies AG, Molex, and SIEMENS AG. These surveyed companies pay significantly greater attention to management innovation. Most of the indices among the four companies are deemed very important. For example, all companies assert philosophy innovation is an important factor and communicate across all departments. Moreover, some of the electronic companies perceive a less level of importance for the organization and structure innovation element. In this industry, culture & environment innovation consumes the larger share due to the focus placed on service and performance of the employees. Other revealing facts suggest that all companies perceive technology innovation to be the most important factor, thereby supporting it strongly. Due to a heavy dependence on technology, electronic companies are required to promote technological innovation.

5.6. Biological and pharmaceutical industry

Results on the biological and pharmaceutical industry suggest good overall management innovation skills, with varying impressions of philosophy innovation made by the companies within. Almost half of the companies involved in the research would pay greater attention to the philosophy innovation. The survey of this industry also indicates that most of the companies design and redesign various operation management systems on the basis of different market strategies. One company, Altana renders culture & environment quiet important for their innovation development process.

Regarding culture and environment on innovation, entities within this industry are mobilized to develop new ideas, while corporate priorities are used to provide focus and structure as part of ideal management. In companies such as Bayer, management inferred that they intent to pay increase attention to the technology innovation, as it can be based on the combination of existing products, production of new products, and updated features. Thus, Bayer focuses roughly 50% of the innovation priorities to the business innovation.

5.7. Energy and resource industry

Drawn from the data, most companies in this industry realize the importance of innovation. These companies consider philosophy innovation as an important factor. However, given the age of the industry, the perception is that the only way to compete with the new resource industry is to innovate and create new kinds of products. Despite being better positioned and highly more experienced than others, the

surveyed companies are deemed old and senior within this industry. Novel ideas and creative methods fall behind those of some smaller entrepreneurs. When it comes to culture and environment innovation, companies realize the importance of laws and regulations and follow the needs of customer to change existing strategies, thus setting various strategies in order to adapt to different rules and laws.

With technology innovation, the process and responsibilities rise steadily. Companies in this industry, such as MARQUARD & BAHLS and RWE, hold customer segmentation as a very important factor therefore complying. Though recognizing the importance, as leaders in the industry, they face greater pressure to focus on competition challenges to innovate.

5.8. Chemical industry

Charue-Duboc Florence, a professor of the CNRS (The French National Center for Scientific Research) held a view that Germany is usually considered to be a dominant power in the European chemical industry. The professor attributed this to the industry's association with companies of international stature, including Bayer, Basf, Altana, and such like. The production of commodities has remained an important component of the chemical industry. Globalization, mergers and acquisitions have characterized the recent period in this industry. In general, the chemical industry of Germany is not only dominant in the Europe, but take a leading place in the world. Also noticed from the survey is the seldom occurrence of a cross-functional innovation steering group at corporate level; i.e. innovation targets are set across special part of company functions such as manufacturing, R&D, etc. However, in technically based organization and structure innovation, the responsibilities for collecting and evaluating market, technology, and competitor and business data are clearly allocated, and the companies usually prioritize research and technology investments to be able to access required technologies. Developing strategies for the chemical industry, in response to increasing costs-declining returns in R&D; declining demand for its products; and globalization of production, markets and R&D itself; are initially to diversify into, or increase their reliance on higher value-added areas such as drugs, agrochemicals, designer crops, specialty chemicals, advanced materials and catalysts, with an increased R&D focus on the life sciences. Therefore, companies utilize technology to develop new products or service, and improve on current processes and business model.

5.9. Manufacturing engineering and machinery industry

Primarily, in the manufacturing engineering and machinery industry, companies hold good attitudes towards innovation, with half of the companies in this industry indicating that innovation is very important. For philosophy innovation, two-third of companies considers it to be important, with all companies focusing significantly customer segmentation. However, less attention is given to participants and sources, as displayed in the distribution levels which remains quite even. Companies treat organization and structure innovation as an important factor; most of which pay more attention to product innovation than to process and business innovation. This may be in light of the companies' nature to create new sources of electric power and gas, allowing them to adapt to the changes and challenges of the society. However, as evidenced suggests, technology is a significant factor for companies to consider.

6. Conclusion

The goal of this research was to evaluate the innovation management structure of German companies, in light if their continuous success. From the analysis, the following was concluded. The general German company attaches a noticeable level of importance to innovation within the organizational process and structure, both in cultural and environmental; results which were of prior expectations to the research.

Innovation aids companies from various industries to improve their production and competitive capabilities. In energy industry, exploitation into new resource areas—solar energy, wind energy, and biomass energy was made possible. This could not have been possible through traditional means.

Annually, companies reinvest a considerable part of their profit into innovation initiative. Such evidence is also displayed in the high and new technology-based companies, where profits are dependent upon the emergence of ideas. Within the electronic industry, companies have invested an excess of 50% of their annual budget in the research of new techniques.

Innovation has been used to improve services and management, particularly in the sales and distribution sectors. Increasingly, companies are paying greater attention to user experience post-launch, allowing them to uncovering possible discrepancies in the company's products or services at low cost. Additionally, companies are internally searching and advocating for new ideas. This is further coupled with the recruitment process.

Despite the initial focus of this research, actions were identified which would not allow companies to improve innovation, regardless of large investment made. In the energy industry, the main methods used to obtain oil continue to play an important role in the process of exploitation. Further, some companies which produce traditional instruments such as pianos are valued by their similarity to the classics. Inefficient behaviors cannot be avoided through innovation.

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References

Afuah, A. (1998). *Innovation management: Strategies, implementation, and profits*. New York, NY: Oxford University Press.
Aghion, P., Howitt, P., & Prantl, S. (2015). Patent rights, product market reforms, and innovation. *Journal of Economic Growth, 20*, 223–262. http://dx.doi.org/10.1007/s10887-015-9114-3
Birkinshaw, J., Hamel, G., & Mol, M. J. (2008). Management innovation. *Academy of Management Review, 33*, 825–845.
Breitschopf, B., & Grupp, H. (2004). Innovation dynamics in OECD countries: Challenges for German enterprises. *International Economics and Economic Policy, 1*, 135–155. http://dx.doi.org/10.1007/s10368-004-0021-x
Brenner, M. (1994). Tracking new products: A practitioners guide. *Research Technology Management, 37*, 36–40.
Chen, C., & Huang, J. (2009). Strategic human resource practices and innovation performance—The mediating role of knowledge management capacity. *Journal of Business Research, 62*, 104–114. http://dx.doi.org/10.1016/j.jbusres.2007.11.016
Edison, H., Bin Ali, N., & Torkar, R. (2013). Towards innovation measurement in the software industry. *Journal of Systems and Software, 86*, 1390–1407. http://dx.doi.org/10.1016/j.jss.2013.01.013
Galindo, M. Á., & Méndez-Picazo, M. T. (2013). Innovation, entrepreneurship and economic growth. *Management Decision, 51*, 501–514. http://dx.doi.org/10.1108/00251741311309625
Garnier, J. (2008). Rebuilding the R&D engine in big pharma. *Harvard Business Review, 86*, 68–76.
Gobeli, D., & Brown, D. (1987). *Analyzing product innovations. Research management, 30*, 25–30.
Hamel, G., & Getz, G. (2004). Funding growth in an age of austerity. *Harvard Business Review, 82*, 76–84.
Hansen, M., & Birkinshaw, J. (2007). The innovation value chain. *Harvard Business Review, 85*, 121–130.
Kleinschmidt, E., & Cooper, R. (1995). The relative importance of new product success determinants: Perception versus reality. *R&D Management, 25*, 281–297.
Mootee, I. (2013). *Design thinking for strategic innovation: What they can't teach you at business or design school.* Hoboken, NJ: Wiley.
Pedersen, C., & Dalum, B. (2004). Incremental versus Radical Change-the case of the Digital North Denmark Program. International Schumpeter Society Conference. Italy: DRUID/IKE Group, Department of Business Studies, Aalborg University.
Prather, C. (2010). *Manager's guide to fostering innovation and creativity in teams*. New York, NY: McGraw Hill.
Preissl, B., & Solimene, L. (2003). *The dynamics of clusters and innovation beyond systems and networks.* Berlin Heidelberg: Springer-Verlag. doi:10.1007/978-3-642-50011-4
Rogers, E. (1983). *Diffusion of innovations*. New York, NY: The Free Press.
Rothwell, R. (1992). Successful industrial innovation: Critical success factors for the 1990s. *R&D Management, 3*, 221–223.
Rubenstein, A., Chakrabarti, A., OKeefe, R., Souder, W., & Young, H. (1976). Factors influencing innovation success at the project level. *Research management, 19*, 15–19.
Scocco, D. (2006, July 29). *Innovation and Schumpeter's theories.* Retrieved November 2015, from Innovation Zen: http://innovationzen.com/blog/2006/07/29/innovation-management-theory-part-1/

The Knowledge Group. (2015). *The global innovation index 2015, effective innovation policy for Development*. Geneva: The World Intellectual Property Organization.

Thompson, M., & Heron, P. (2006). Relational quality and innovative performance in R&D based science and technology firms. *Human Resource Management Journal, 16*, 28–47. http://dx.doi.org/10.1111/j.1748-8583.2006.00003.x

Wagner, S. (2008). Innovation management in the German transportation industry. *Journal of Business Logistics, 29*, 215–231.

World Bank. (2014). *Data*. Retrieved November 2015, from World Development Indicators: http://data.worldbank.org/products/wdi

World Economic Forum. (2015). *The global competitiveness report*. Geneva: World Economic Forum.

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