

# **The Evolution of General Electric's Product Innovation Strategy**

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*The purpose of this study was to develop new insight and understanding on the evolution of the innovation strategy in General Electric (GE), a global organization. The significance of the study comes from utilizing content and documentary analysis to merge the academic innovation literature together with GE's 1892 to 2011 annual industry reports. The resultant outcome from the consolidation of the two literatures is a chronological timeline identifying GE's product innovation strategies. This extensive chronology, spanning across 120 years, provides valuable insights into the sustained growth, wealth creation and global competitive positioning of GE through its innovation strategy. The findings in this translational study hold significance in academic and industry contexts as they contribute to the body of theoretical and practical knowledge regarding the evolution of innovation strategies in large global organizations. To date, there is no current literature documenting the evolution of innovation strategy building for success within large global organizations. Thus the practical and theoretical significance generated in this pioneering study are confirmed through real life examples of successful innovation strategies which may be used by academics and industry practitioners in their teachings, learnings and practices.*

## **1. Introduction**

Innovation is a driver for sustainable growth (Hamel, Birkenshaw & Mol 2008). Despite the fact that innovation has been a key-factor in generating results and outcomes, the innovative activity itself has not always been understood in a planned way (Marins 2012).

From a macroeconomic perspective innovation is now considered a prerequisite for driving economic growth and job creation. For emerging markets innovation is a powerful lever countries can use to accelerate an increased standard of living. In developed markets, countries can use innovation to sustain and secure their competitive position as global competition continually intensifies (Annunziata 2012).

The role of global organisations in driving growth and job creation through innovation is significant. In the global economy they can do this by increasing their levels of investment in innovation, acting as a counterweight to protectionist trends, sourcing the best global talent, drawing upon a diverse geographically dispersed customer base and by securing access to local partners along the product chain all to better understand local regulations (Annunziata 2012).

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Policy makers and executives generally agree that the lack of innovation is the most critical problem facing the global economy. Not surprisingly, both suggest that innovation is a top priority for growth (McKinsey 2007). Whilst innovation is central to a country's growth, a company's strategy and its performance, getting it right is as hard as ever (McKinsey 2007). Companies can no longer get by with a partial or episodic commitment to innovation (Tucker 2012).

To date, there is no current literature documenting the evolution of innovation strategy in building for success within large global organizations. There exists knowledge gap as to whether the innovation strategies of large organisations are planned and deliberate, or whether they emerge 'by themselves', driven by external trends and events or by strategic organizational design and processes. More exploratory and empirical studies are needed to enhance our understanding of the complex nature of innovation in today's competitive environment and its contribution to long-term business success (Zhao 2005). Therefore, this study seeks to contribute to the body of theoretical and practical knowledge of innovation whereby the research question underlining this study is:

*Q.1 How has the product innovation strategy evolved in General Electric (GE), a large global organization?*

The remainder of this paper provides an overview of the chosen research method (Section 2), followed by a review of the existing literature (Section 3) on the evolution of innovation in large organizations. Section four (4) provides an overview of the documentary and content analysis of GE industry reports from 1892 to 2011, whilst creating a chronological timeline identifying GE's product innovation strategies. Section five (5) then provides valuable findings into the sustained growth, wealth creation and global competitive positioning of GE through its innovation strategy, with Section six (6) providing the conclusion of the research.

## 2. Literature Review

For more than 60 years, there has been a considerable body of academic research and writing addressing aspects of innovation. The earliest definition of the concept of innovation can be traced back to the mid-twentieth century through the pioneering work of Schumpeter (1939, 1943) and its application within economic science.

The earliest definition by Schumpeter (. *ibid*) described innovation as a historic and irreversible change in the way of doing things. However, following the pioneering work of Schumpeter, for a long time innovation just happened (Stamm & Trifilova 2008). What's more, it was actually a while before researchers started to analyze the innovation phenomenon and investigate how to improve and manage innovation (. *ibid*).

Research on innovation has provided insight upon a number of factors at three levels of analysis – the individual, work group and the organisation more widely – which have been found to be supportive of innovation outcomes (Anderson et al. 2004) Despite the fact that innovation has been a key-factor in generating results and outcomes, the innovative activity itself has not always been understood in a planned way (Marins 2012). The complexity of the process is not well understood (Delmar et al. 2003) and the conceptual thinking is at times limited (McMurray & Dorai, 2003).

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Innovation research has been found to be fragmented, poorly grounded theoretically and not fully tested in all areas (Crossan & Apaydin 2010).

Whilst many factors are documented which contribute to the evolution of innovation in organizations such as technological innovation (Tidd 2006) organizational innovation (Isaken & Tidd 2007), service innovation (Frei & Morris, 2012) disruptive innovation (Christensen 2011), business model innovation (Osterwalder & Pigneur 2010), customer centric innovation and open innovation (Chesbrough 2003) and most recently crowd sourced innovation there is no current literature documenting the evolution of innovation strategy in building for success within large global organizations. However, the literature shows that innovation is essential to organisational survival (McMurray et al. 2013). There exists knowledge gap as to whether the innovation strategies of large organisations are planned and deliberate, or whether they emerge 'by themselves', driven by external trends and events or by strategic organizational design and processes. This is a neglected area in the literature and thus one which has informed the research question.

Therefore, this study seeks to contribute to the body of theoretical and practical knowledge of innovation by investigating how has innovation strategy evolved in General Electric (GE), a large global organization.

### **3. Research Method**

A qualitative documentary and content analysis was undertaken on GE's annual industry reports from 1892 to 2011. These reports were the only available company reports published during research period throughout July 2012. The reports were viewed in hard copy and electronically on GE's website, through an interactive visualization database. A summative content analysis included the use of a key word search of "Innovation" through the interactive visualization database on GE's website, to identify the years and number of references to innovation. The key word search was further supplemented with a manual search of these documents for a more in depth and systematic analysis of the GE literature for the purpose of finding, understanding patterns and regularities in respect to GE's product innovation strategy. It was recognised that throughout this study that if the analysis stopped at the key word search stage, the analysis would be considered quantitative only, focusing on counting the frequency of specific words or content (Kondracki & Wellman 2002) Therefore, a more conventional content and documentary analysis was also conducted to deconstruct text and derive insights and meanings of the way in which innovation was identified in the annual reports as being embedded within GE. Documentary and content analysis was chosen as the preferred research method for the study on the basis that it allows for the subjective interpretation of the content of text data through a systematic classification process of coding and identifying themes and patterns (Hsieh & Shannon 2005). This approach was used to discover underlying means of the words and content. Moreover, this approach is preferred when existing theory and research literature is limited (Hsieh & Shannon 2005). However, it is recognised that this approach does have limitations that may include a failing to develop a complete understanding of the context.

### 4. Documentary and Content Analysis of GE Industry Reports from 1892 to 2011

For the purpose of this study, only the product innovation strategy as it has evolved in GE from 1892 and 2011 has been investigated. What follows is a documentary and content analysis from this extensive chronology, spanning across 120 years and areas for future research.

GE's product driven strategy, emerged shortly after its formation in 1892. At the same time GE was also pursuing growth through rapid invention and the concurrent positioning of company in the market place through the creation of patents and patent protection through litigation and licensing. Strength of patent protection is a strong determinant of the relative commercial benefits to innovators and imitators (Tidd 2006). The disturbed financial and political conditions in 1890s lead to a reduction in ordinary capital available for expenditure programs by a number of GE's major customers which were power and light utility companies. This negatively impacted GE's established product lines, core technologies and put pressure on the organisation's competitive position. In response to this period of decline, GE's product strategy emphasised incremental improvements and extensions to existing product lines. This approach to product innovation is found to be consistent with the traditional, outcome orientated view of innovation (Utterbeck 1971, Levitt, 1960, Bessant & Tidd, 2007). From this period on, for the most part all products would launch in the United States (US) and were then quickly introduced to global market.

Significantly, in 1900 GE opened its first industrial research and development laboratory in the US. One of the earliest projects of the new laboratory was to defend the company's primary asset – incandescent lighting through innovation. The invention of the ductile tungsten filament in this laboratory made the GE incandescent lamp significant more durable than the original design. This invention also secured GE's technological leadership in the market through its lighting products and epitomised the role of research driven product innovation strategies of GE, and then bringing that innovation to the marketplace (GE 2012). In 1910, GE still pursued a product driven strategy. However, new products were now being designed to meet novel conditions. Significantly this is was the first indication that the company was contextualising its product innovation strategy. New products designed “meet any conditions” continued to enhance GE's competitive position by driving strong sales, particularly in 1913. This was the organisations best performing year on record with sales of approximately \$US 106 million. Strong demand enabled also GE to substantially add to its manufacturing capacity. For the next decade, GE would focus on core technologies and products, mixed with a strategy of product differentiation, referred previously as contextualisation. The product innovations were supplemented by strong investment into research and development (R&D) as a percentage of sales and an aggressive expansion program to add manufacturing capacity to meet demand. The period from 1910 to 1920 was characterized by heavy competition in the electrical manufacturing marketplace. Both case studies and statistical analysis show that competitive rivalry stimulates firms to investment in innovation and change (Tidd 2006). It is during this period, that GE's strategy of initial growth would more formally emerge and the organization would soon leverage core inter-related technologies from its electrical manufacturing businesses to create entirely new businesses, such the technology which would be jointly used in both GE power turbines and GE jet engines. GE's strategy of product innovation through research and development was influenced strongly by GE's first chief executive

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Charles Coffin, who led GE from 1892 to 1922. Coffin had deep engineering knowledge and an unrelenting pursuit for scientific and technical progress. Under Coffin's leadership GE had established the first laboratory in the US dedicated to scientific research. Research activities became the foundation for the company's strategy of innovation for products and services on the understanding that basic and applied research was fundamental to every field in which the company has an interest.

Size and scale when used correctly can be unrivalled competitive advantage. Drawing from its expanded manufacturing base and large numbers of employees 1922 GE systematised a suggestion system to stimulate the initiative of employees and encourage suggestions for better ways of doing things. Suggestions called for improvements that would result in better service to customers, better products, shop methods or equipment and lower cost of production, to name but a few. Within seven years of existence the suggestion system had generated over 29,919 suggestions (536 per 1000 eligible employees) and over 32 per cent of suggestions were adopted. Notable improvements included the internal rearrangement of production processes and methods that lead to reduced selling prices of existing products. GE's strategy for sustained growth and innovation has been undertaken through long range programs of product development founded through significant investment into GE's research and engineering facilities. This repeated, continuous innovation with an underlying assumption of "doing what we do, only better" is consistent with the traditional outcome orientated focus of innovation. While these innovations took place within an established framework, significant step changes in the product/service offering throughout GE's history are evident. One of GE's strengths is its ability to invest into R&D irrespective of the prevailing economic cycle and create business opportunities in periods of uncertainty. In 1932, GE's response to the Great Depression was to create the GE Credit Corporation to help finance the sale GE appliances.

Post WWII, GE's organizational structure was decentralized and a strategy of diversification of products and services was pursued. More products were introduced to the market at lower cost, driven from the learning curve in production and the accumulation of knowledge gained from investment into research and engineering. By 1947 GE had formally established a policy of selling its products at the lower possible price consistent with a yield of reasonable profit. The process of commercialisation of technology before and during this period was perceived as a linear progression from scientific discovery to marketplace (Ortt & Van der Duin 2008). Interestingly GE's annual report of 1949 was the first report to formally reference innovation. However, this is not surprising considering the earliest definition of the concept of innovation can be traced back to the pioneering work of Schumpeter in 1939, 1943 and its application within economic science. In 1950, GE introduced long range scenario planning. However its product driven strategy still centred around modern, well equipped research and manufacturing facilities to produce products of the highest possible. This strategy had not changed since 1900. However, 1952 did mark the first substantial change of GE's product strategy in recognition of the need to be innovative in both their products and services. GE shifted the focus from designing and selling physical products to selling a combined system of products and services jointly capable of fulfilling specific client demand (Velamuri et al. 2008, p2. quoting Manzini & Vezzoli, 2002). In 1960, the company remarked that one third of products to be made in the 1970s would be either totally unknown to the company or were simply ideas in the minds of employees. In 1961

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an estimated \$US2bn or about one half of GE's sales came from new products introduced since the beginning of WWII. For GE, decreased product lead time and after sales services can be attributed as being the major source of protection against imitation, especially for its product innovation during this period (Tidd 2006). GE's continued long term commitment to product development during the 1960s was heavily influence by then CEO Ralph.J.Cordiner. Cordiner had a long term vision for the company through a decentralized organizational structure and by planned diversification into new markets and technologies. In 1968 GE perused a strategy of increased diversity from core of electrical technologies as well as product and service portfolio that was broadened to include space, electronics, automation, power plants, chemicals, plastics, computers and nuclear technology. In addition, a major emphasis of accelerating growth in service businesses was implemented that year. By 1974 GE reported product services were a growing worldwide business for GE and by 1979 services revenues generated 16% of GE's earnings (\$US22.5 billion).

The 1980s brought with it a focus on technical innovation to drive every possible product, service and process in GE. However, the product driven strategy established some 80 years ago still remained. This represented 85% of GE's revenue (\$UD24.95 billion) from the sale of products in 1980. The next decade, was characterized by a shifting mix of GE businesses toward high technology products and high growth services, supported by strong investment into R&D as a percentage of sales, as well as an accelerated rate of acquisitions and dispositions. Services growth and innovation in this period was undertaken through the addition of entrepreneurial people. The 1990s, under the leadership of Jack Welch marked a departure from long range programs of product development that were the driving force of GE's product innovation strategy since 1900, to a focus on speed to market and inventions originating through acquisitions of other companies into a GE unit or as of the result of alliances (Desouza et al. 2009). Welch's leadership at this time was heavily focused on services and in 1996 the company reported that it was to become a global service company that also sells high quality products. In 1997, GE forecast that more than two thirds of revenue (approximately \$UD60 billion) would come from financial, information and product services. In fact, in 2000 70 per cent (\$US 91 billion) of GE's business was derived from services.

Up until 2000, GE had predominantly relied on its US businesses for their strategies skills and expertise in formulating and executing their product innovation strategies. Porter (1990) has shown that business firms even the largest ones competing in global markets are strongly influenced in their strategies by the conditions in their home countries. Significantly, it was not until the year 2000 that GE created products for local and emerging market needs. GE sought to leverage technologies developed outside of the US, to meet the needs of emerging markets in an increasingly globalized world. GE's strategy of product innovation was perused only because its US operations were now insufficient to drive greater growth, in a globalized world, in order to meet customer needs outside of the US. GE's Technology Center in Bangalore, India was the company's first and largest integrated multidisciplinary Research and Product Development Center outside the US. GE has subsequently open additional centres in China Germany, Brazil. More recently, in the middle to late 2000s GE has looked to reverse innovation and programs of open innovation to drive its product innovation strategies for global growth.

### 5. Findings and Discussion

It is suggested that the most successful innovative companies do not succeed merely by using one innovation approach more extensively or better, but by carefully selecting the right approach within a given context (Griffin, 1997- cited in Ortt & Van der Duin 2008). However, this extensive chronology, spanning across 120 years, has found that since 1900 GE's strategy has been product driven for the global market. For the most part of this period all products were launched in the United States and then were quickly introduced to global markets. It was not until the year 2000 that GE created products for local and emerging market needs.

The chronology has uncovered that GE's competitive advantage was based on and continues to be research driven, based either on scientific breakthroughs or incremental research. The complexity in understanding the application of research and development across GE's diverse businesses proves difficult for competitors in learning about and imitating the technology, therefore keeping the barriers to entry high.

GE's strategy for sustained growth has been undertaken through long range programs of product development founded through significant investment into research and engineering facilities. Notably the company will spend \$16 billion on R&D alone from 2010 to 2012. This is more than double its historical average and about 6% of its industrial revenues (GE 2011). The chronology finds that this research focus and investment has seen speed of improved product design and methods of manufacturing.

The chronology shows that GE's initial growth strategy has not changed overtime. Investment into R&D has continued to occur irrespective of the economic cycles. GE's response to the Great Depression was to create the GE Credit Corporation to help finance the sale GE appliances. Moreover, the organization has continued to dominate selected technologies and industries. A method has been to create new companies from core research and development outputs and related technologies.

The chronology has identified that GE's sustained growth strategy has not changed. The organization having established innovative products then developed a suite of valuable services for each product innovation. In addition, training and customer inclusion developed the next range of ideas for new products. In effect GE trained its customers / users to drive innovation.

The chronology highlights that leadership and its influence on GE's organizational culture has been a key determinant of GE's success. Over the period studied GE's leadership has been characterized by a shared vision for future growth based on research, development and innovation. Individual leaders, of which there have been only 10 Presidents / CEOs who have lead the company over the last 120 years have consistently demonstrated clarity of direction, emphasis on quality, speed, execution and the demand for innovation.

In essence, GE's product driven innovation strategy has maintained focus and been executed with discipline and consistency for more than 100 years. At times it has been supplemented with process innovation. It is not surprising that of the 12 original companies listed on the Dow Jones Industrial Average in 1896, GE is the only company that still exists 116 years later.

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GE is one of the world's most successful and admired companies, renowned for its consistently outstanding financial performance and for the quality of its people and its operations. GE has not overtly shared an explicit innovation strategy, nor is there an identifiable company policy from the last 120 years that helps match its innovation goals with the strategic objectives of the firm. However, notwithstanding the absence of an identifiable innovation strategy GE is perhaps a text book example of good innovation practice: ploughing a high percentage of sales back into R&D, working closely with lead users to understand their needs and developing product innovation alongside them, delivering a steady stream of continuous product and process innovations and at the right time systematically exploring the full extent of innovation space defined by their market (Tidd 2006).

The review and analysis of GE's industry literature indicates that GE continues to display behaviours and measurements based on outputs, with the GE industry reports and literature placing consistent emphasis on quantifiable outputs. This provides opportunities for further research to investigate GE's organizational processes which impact on and generate organizational innovation.

### **6. Summary and Conclusion**

The purpose of this study was to develop new insight and understanding on the evolution of the innovation strategy in GE, a global organization. This was achieved through the systematic analysis of GE's industry literature which was supplemented by the academic literature in developing the chronology identifying GE's strategies for success over the past 120 years.

GE's industry literature indicates that GE continues to display behaviours and measurements based on outputs as the GE industry reports and literature place consistent emphasis on quantifiable outputs. The findings in this translational study hold significance in academic and industry contexts as they contribute to the body of theoretical and practical knowledge regarding the evolution of innovation strategies in large global organizations. Thus the practical and theoretical significance generated in this pioneering study are confirmed through real life examples of successful innovation strategies which may be used by academics and industry practitioners in their teachings, learnings and practices

As with all studies, there are limitations in this study. One limitation is that the data was drawn from secondary sources. Although precautionary measures were taken to ensure the data's authenticity through annual reports which are subject to approval from GE's Management and Board of Directors. Financial statements are also prepared in accordance US generally accepted accounting principles (GAPP).

Future studies may like to consider investigating the other factors such as organizational processes which contribute to the strategic success of global organizations.

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