

# The Evolution of GE's Product Innovation Strategy

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## Abstract

Innovation is a driver for sustainable growth (Hamel et al, 2008). Innovation factors such as capital investment and increased efficiency are considered to be responsible for almost 75 per cent of the USA's post-WW II growth rate (Rai & Doms, 2010). 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). Current innovation research is fragmented, poorly grounded theoretically and not fully tested in all areas (Crossan & Apaydin, 2010).

The purpose of this study was to develop new insight and understanding on the evolution of the innovation strategy in GE, a global organization.

Utilizing documentary analysis to consolidate the academic innovation literature together with GE's 1892 to 2011 industry reports, the study consolidates the two literatures and develops 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.

# Introduction

Innovation is a driver for sustainable growth (Hamel et al, 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).

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).

This study seeks to contribute to the body of theoretical and practical knowledge of innovation by investigating how the innovation strategy has evolved in General Electric (GE), a large global organization. There are many factors that 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. However, for the purpose of this study, only the product innovation strategy as it has evolved in GE from 1892 and 2011 is addressed. What follows is the documentation of the research method, an analysis of GE’s annual reports and the innovation literature which provides a discussion of the findings from this extensive chronology, spanning across 120 years and areas for future research.

## Research Method

A documentary analysis of GE’s annual industry reports from 1892 to 2011 was conducted. These reports were viewed in hard copy and electronically on GE’s website through an interactive visualization database. The research approach utilized included the use of a key word search of “Innovation” through the interactive visualization database, to identify the years and number of references to innovation. This 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 innovation strategy.

The documentary analysis employed a quantitative approach which generated frequency counts of the number of times the key concept appeared within the annual reports. A qualitative analysis was 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. Both quantitative and qualitative approaches were utilized to complement one another and provide an in-depth analysis of the academic and industry literatures.

# Chronology of GE's Product Innovation Strategy

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 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 and 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 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.

## Findings

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 and 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 quickly were 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 & 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.

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 as the GE industry reports and literature place consistent emphasis on quantifiable outputs. This provides opportunities for further research to investigate GE's organizational processes which impact on and generate organizational innovation.

## **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.

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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).

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.

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

## References

- Chesbrough, H (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology* Harvard Business School Publishing
- Christensen, M (2011) *The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business*, Collins Business,
- Crossan, M & Apaydin, M (2010) *A Multi-dimensional Framework of Organisational Innovation: A Systematic Review of the Literature*, Journal of Management Studies 47:6 September 2010
- Desouza, K., Dombrowski, C., Awazu., U., Baloh, P., Papgari,S., Jha,S and Kim, J (2009) “*Crafting Organisational innovation processes*” *Innovation: Management , Policy and Practice* Vol 1, Issue 1 April 2009
- Frei., F and Morriss, A (2012). *Uncommon Service: How to Win by Putting Customers at the Core of Your Business*. Cambridge: Harvard Business Review Press
- General Electric (GE) (2012) [www.ge.com](http://www.ge.com) (accessed 22 May 2012)
- Hamel, G., Birkenshaw, J., Mol, M (2008) *Management Innovation*, *Academy of Management Review* 2008, Vol 22, No.4 825-845.
- Isaksen, S & Tidd, J(2007) *Meeting the Innovation Challenge: Leadership for Transformation and Growth*. Wiley
- Kemmis, S & McTaggart, R (1988) *The Action Research Planner*, 3<sup>rd</sup> Edition, Victoria, Deakin University Press.
- Kline, S.J. & N. Rosenberg (1986), “*An overview of innovation.*” In R. Landau & N. Rosenberg (eds.), *The Positive Sum Strategy: Harnessing Technology for Economic Growth*. Washington, D.C.: National Academy Press, pp. 275–305.
- Levitt, T. (1960), “Growth and profits through planned marketing innovation”, *Journal of Marketing*, 24, pp. 1-8.
- Malerba, F and Brusoni, S (2007) *Perspectives on Innovation*, Cambridge University Press
- Marins, L (2012) *The Challenge of Measuring Innovation in Emerging Economies' Firms: A proposal of a new set of indicators on innovation*, Maastricht Economic and Social Research Centre on Innovation and Technology (accessed 22 May 2012)

- McMurray, A. K & Dorai, R (2003) *Workplace Innovation Scale: a new method for measuring innovation in the workplace*. Paper presented at the 5<sup>th</sup> European Conference on Organisational Knowledge, Learning and Capabilities (OKLC 2003) April 2003, Barcelona, Spain.
- Mesquita, A (2011) *Technology for Creativity and Innovation: Tools, Techniques and Applications IGI Global*
- Neely, A & Hill, J (1998) *Innovation and Business Performance: A Literature Review*, The Judge Institute of Management Studies, University of Cambridge
- Ortt, R & van der Duin, A (2008) *The Evolution of Innovation Management Towards Contextual Innovation*, *European Journal of Innovation Management*, Vol 11 Iss 4 pp 522-538
- Osterwalder, A and Pigneur, Y (2010) *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*
- Rai, R., Doms, M (2010) *Patent Reform: Unleashing Innovation, Promoting Economic Growth & Producing High Paying Jobs*, A White Paper from the US Department of Commerce, April 13, 2010
- Porter, M (1990) *The Competitive Advantage of Nations*, Macmillan, London
- Schumpeter, J (1939), *Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process*, 2 vols., New York: McGraw-Hill
- Schumpeter, J (1943) *Capitalism, Socialism and Democracy*, New York: Harper.
- Tidd, J (2006) *From Knowledge Management to Strategic Competence: Measuring Technological Market and Organisational Innovation*. London: Imperial College Press. (Series on Technology Management; Vol. 3)
- Tidd, J (2006) *Innovation Models*, Paper 1 Imperial London College, Tanaka Business School
- Tidd, J., Bessant, J & Pavitt, K (2001) *Managing Innovation: Integrating technological, market and organizational change*. Wiley
- Tidd, J and Bessant, J (2009) *Managing Innovation: Integrating technological, market and organizational change*. Wiley
- Tucker, R (2012) *Strategy Innovation Takes Imagination*, [www.innovationresource.com](http://www.innovationresource.com) (accessed May 25, 2012).
- Utterback, J.M. (1971), "The process of technological innovation within the firm", *Academy of Management Journal*, Vol. 14, pp. 75-88.

Velamuri, V., Neyer, A.K and Moeslin, K.M (2008) “*What influences the design of hybrid product?*” *Lessons learned from the preventative healthcare industry*” paper presented at EURAM, Ljubljana. May

Zhao, F. (2006) *Technological and Organisational Innovation: case study of Siemens (Australia)*, *International Journal of Innovation and Learning*, Vol 3, No1 pp 95-109.