

The Innovative Capacity of Firms

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ABSTRACT

Innovation is widely accepted as a crucial competitive weapon in today's global market place. Yet the levels of innovation achieved by different firms, even within the same industry, can vary widely. The key question raised by this observation is why. Why are some firms more innovative than others? What are the factors that determine a firm's capacity to innovate and how can these be managed to enhance the firm's innovative potential? This paper sets out to address these and related issues. It reports the results of a study of competitiveness and innovation of firms in the East of England. In the paper it is argued that the innovative capacity of a firm is a function of the firm's culture, resources, competences and networks. Justification for this framework is provided by a review of the relevant literature and a series of case studies examining the capacity to innovate of a sample of firms in the East of England.

Keywords: innovative capacity, innovative capability, measurement of innovation

1.0 Introduction and Background

In April and May 1996, representatives of 75 manufacturing businesses in the East of England were interviewed by a team of researchers from the University of Cambridge. During each interview, questions were asked about five main areas: (i) business strategy; (ii) market place; (iii) innovation; (iv) human resources; and (v) investment. The data collected were analysed in several different ways, one of which involved using value added per employee to distinguish between high and low performing companies in the region (see figure 1). The results of this analysis suggested that high performing companies in the East of England, within the mechanical engineering and electrical engineering sectors, tended to:

- Have a unique product or technology.
- Have an in-house design capability.
- Serve demanding customers.
- Charge premium prices.

The theme that appears to unify these findings is innovation. Businesses retain in-house design capabilities to ensure they maintain a capacity to innovate. If used correctly this capacity to innovate enables them to develop unique products or technologies which satisfy the performance expectations of demanding customers and which can be premium priced. (Perman, Nelly & Walsh, 2011)

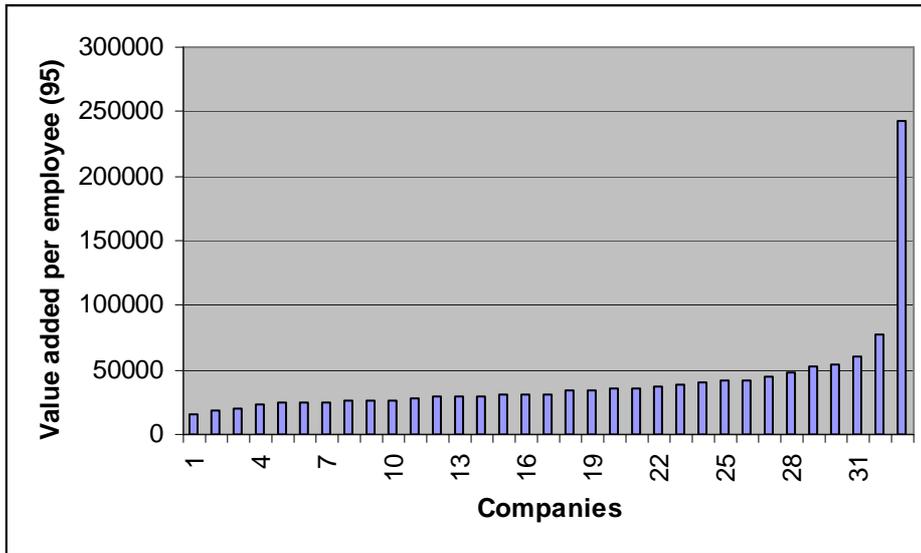


Figure 1: Value Added per Employee in a Sample of Firms Based in the East of England

In light of these findings the Government Office for the East of England decided to commission a follow-up study to explore in more detail, the relationship between innovation and business performance. Specifically, the follow-up study was designed to address the following question – why are some firms more innovative than others. The study consisted of two phases. The first involved a review of the academic literature on the subject of innovation. The second involved the development and pilot testing of a theoretical framework designed to explain the level of innovation achieved by different firms. In total 21 companies across 3 different sectors: Automotive, Electronics and Scientific, participated in this second phase.

2.0 Definitions of Innovation

In simple terms, innovation involves the exploitation of new ideas. Innovation is often confused with invention. Freeman (1982), however, makes clear the distinction, when he notes: “an invention is an idea, a sketch or model for a new or improved device, product, process or system”, whereas “an innovation in the economic sense is accomplished only with the first commercial transaction involving the new product, process, system or device”. The OECD (1981) expand this assertion, by proposing that “innovation consists of all those scientific, technical, commercial and financial steps necessary for the successful development and marketing of new or improved manufactured products, the commercial use of new or improved processes or equipment or the introduction of a new approach to a social service. Research and Development is only one of these steps” (Nelly, 2009).

Innovation then, is not limited merely to product innovation, for it also encompasses process innovation. Product innovation refers to a new or improved product, equipment or service that is successfully introduced to the market. Process innovation involves the adoption of a new or improved manufacturing or distribution process, or a new method of social service. It is worth noting, however, that product and

process innovation are not necessarily mutually exclusive. Indeed process innovation may result in a subsequent product innovation and vice versa.

Recently authors have begun to make a further distinction and identify organisational innovation as a separate dimension. Organisational innovation encompasses any change made to the functioning of the organisation – e.g. teamworking, enterprise resource planning, business process re-engineering – which results in more efficient or effective utilisation of human and/or physical resources. Hence, as summarised in the EC's Green Paper, innovation encompasses three broad dimensions: (i) "the renewal and enlargement of the range of products and services and the associated markets"; (ii) "the establishment of new methods of production, supply and distribution"; and (iii) "the introduction of changes in management, work organisation, and the working conditions and skills of the workforce" EC (1995).

In the academic and practitioner literatures the phenomenon of innovation has been studied at three levels - firm, regional and national. At the firm-level, three broad streams of research dominate: diffusion, organisational innovativeness and process theory studies Wolfe (1994). At the regional-level, the concept of innovative milieu suggests that the innovative capacity of firms that are bounded geographically is affected by two factors. First, regional agglomeration facilitates a collective learning process which allows information, knowledge and best practice to be rapidly diffused. Second, the presence of localised production systems helps reduce the costs and risks associated with innovation by spreading them throughout the region via buyer-supplier networks, technology transfer agencies, trade associations and training consortia Camagni et al. (1997); Cooke and Morgan (1994). At the national-level, the concept of National System of Innovation (NSI) has been used to explain the differences observed among various countries in terms of their innovative performance. Each nation has its own specific NSI - a collection of institutions - that support innovative activities within that country. The NSI theory views nation specific factors, such as education, public support schemes and culture as drivers of innovation Freeman (1987); Lundvall (1992); Nelson (1993). Underpinning these studies are two important concepts: (i) the notion that firms possess different capacities to innovate; and (ii) the idea that the firm's capacity to innovate can be affected by a nation's or region's infrastructure.

2.1 The Firm's Capacity to Innovate

A firm's capacity to innovate can be thought of as the potential of that firm to generate innovative output. As such it is dependent upon the resources and capabilities that the firm possesses, as these allow it to explore and exploit opportunities Barney (1986); Teece and Pisano (1994). A recent study, supported by the UK's CBI (Confederation of British Industry) and DTI (Department of Trade and Industry), provides anecdotal evidence which suggests that the key determinates of a firm's capacity to innovate are: (i) the culture of the firm; (ii) the internal processes adopted; and (iii) the external environment. In terms of *culture*, the CBI/DTI study found that innovative companies had a strong culture, a clear sense of mission and purpose, a well thought out strategy and a business philosophy of continuous improvement, driven by total customer satisfaction and total quality management. Highly innovative companies were also reported to have an open, multi-functional and multi-level team-based style of working, empowered employees at all levels and chief executives who demonstrated a strong personal commitment to innovation. In terms of *internal processes*, the highly innovative companies constantly sought to generate and capture new ideas. Employee suggestion schemes were widespread, successful ideas were rewarded and failure was regarded as integral to the learning process. *Externally*, innovative companies looked to customers and suppliers as potential sources of ideas. Regular contact between R&D, design, production, sales, marketing and customers was encouraged. Such firms also reported that investors and Government played a crucial role in the innovation process, the former by providing funding and the latter by influencing firm's choices with regards to industry standards CBI/DTI (1993).

Interpreting these findings, and coupling them with the observations of Barney (1986) and Teece and Pisano (1994) enables the identification of four factors which appear to impinge upon an organisation's capacity to innovate – culture, resources, competence and networks.

- The culture of a firm dictates what is valued within the firm. The skills and knowledge embedded in physical systems and managerial systems are shaped by the firm's culture. Hence, culture plays a key role in the development of a firm's capacity to innovate. It influences the "way things are done" within the firm and the relationships among the firm's employees.
- Resources are the set of assets and skills, which are utilised to create or support the competitive advantage of firms. The endowment of resources, in terms of financial, human and structural capital, is crucial for innovation. Competing firms differ in terms of their resource endowment and hence differences emerge in terms of competitive advantage and innovation performance.
- The competence of a firm gives it the ability to exploit its innovative ideas. Competence includes abilities such as integrating market opportunities with technological abilities, creative problem-solving skills, sharing tacit knowledge and experimentation. The competence of a firm often lies in its engineering, design, research and marketing resources and assets. The role of management is to combine market opportunities with firm competence to generate innovations.
- Knowledge is the foundation upon which innovative ideas are generated. Innovation is fundamentally a cumulative process of learning, searching and exploring. This cumulative process reduces the uncertainties embedded in an innovative activity. Innovations involve the combination of new and old ideas and knowledge to result in new products, techniques, forms of organisation and new markets. Networking initiatives are essential to the ability to innovate, for they act as a vehicle for importing external knowledge. This vehicle is crucial for many sources of innovation do not reside exclusively within an individual firm. Often the bulk of these networking initiatives are informal. Innovative firms rely on both informal and formal networks for their innovations.

3.0 Capacity to Innovate in the East of England

The 110 firms invited to participate in the study were identified through a review of Dunn and Bradstreet's directory of Key British Enterprises. Each of these firms was contacted both by letter and a follow-up phone call. A response rate of 19.1% was achieved, with the result that in total 36 individuals were interviewed across 21 companies. Questionnaires were sent to all firms prior to the face-to-face interviews and plant visits. Representative positions held by interviewees include Managing Director, Operations Director, Technical Director, Engineering Manager, Development Manager and Commercial Manager. The respondents were very experienced in their line of business, with a handful of them being founders of the companies. The broad experience of the respondents and the range of positions within the companies provided a multi-level perspective to the enquiry. Specifically the diversity of people interviewed allowed a more rounded picture of the state of innovation in the samples companies to be formed.

3.1 Survey Instrument

Data were collected through questionnaires, supplemented by face-to-face interviews and plant visits. The questionnaires were divided into five sections. Respondents were asked a series of questions designed to probe for information on innovation and scored on a 5-point Likert scale. Section 1 assessed the level of innovativeness in the firms surveyed. Section 2 explored the issue of a firm's innovative capacity.

Section 3 dealt with obstacles to innovation. Section 4 probed for information sources for innovation. The final section looked at the role of government and the regional innovation infrastructure in stimulating innovation in firms.

The data collected from the questionnaires allowed the researchers to form a pretext for discussions during the face-to-face interviews and plant visits. All of the face-to-face interviews were semi-structured and designed to capture information from respondents who were familiar with their own businesses and who were in a position to comment on the innovation processes that existed in their businesses. Selected issues explored during the interviews included: (i) the maturity of the market, in terms of demand and technology; (ii) the number of competitors in the market; (iii) the market position of the firm surveyed; (iv) the characteristics of the firm that make it able to innovative; (v) the strengths and weaknesses of the firm in terms of innovation; (vi) the innovation related networking carried out by members of the firm; (vii) the obstacles to innovation in the firm; (viii) the source of ideas and information for innovation; (ix) specific suggestions regarding the role of government in stimulating innovation; and (x) the greatest challenges facing managers as they seek to encourage innovation.

4.0 Data Analysis

Data analysis took the form of quantitative and qualitative analysis. The interviews provided a rich pool of information that bear upon issues identified in the study. The main themes of this qualitative data were extracted from the transcripts of the interviews. These are reported mainly as anecdotal evidence in support of the main findings. Quantitative data were able to present the aggregate picture concerning issues such as the impact of innovation, obstacles to innovation, information sources for innovation and innovation infrastructure. The results of the data analysis are summarised below.

4.1 Impact of Innovations

- Product innovation: lowering product costs and increasing the ability to premium price.
- Process innovation: inventory and cycle-time reduction.
- Organisational innovation: increase in accuracy of demand forecast, increase in generation of innovative ideas and increase in employee satisfaction.

4.2 Information Sources for Innovation

- Firms draw on internal and external information for innovation. They rely on networking to import knowledge.
- There is a weak linkage between SMEs and the regional support institutions.

4.3 Obstacles to Innovation

- Small firms struggle with a balance of time, money and people when it comes to innovation.
- Resource constraints impose trade-offs between daily operations and taking time out to develop new ideas.
- Resistance to change and the skill levels are the two main people obstacles.
- Most firms struggle with lack of skills in identifying market needs and delivering the right product to serve the need.

4.4 Role of Government

- There is a general impression that there is a lack of coherence in terms of information dissemination about government grants
- Firms experience rigidity both in terms of criteria of eligibility and bureaucratic procedures when applying for grants.
- Firms with experience of the DTI Open Days were satisfied with the benefits, but expressed concern that schemes of this nature were being shut down.
- Most firms were eager to forge links with knowledge institutions like the universities, but were not certain of the best approach.

4.5 Levels of Innovations in Firms

- The bulk of firms surveyed showed positive increase in innovation trends over the past 3 years.

4.6 Innovation Migration Paths

- Firms differ in their innovative capacities. There are two extremes to innovative development of firms: 'virtuous take-off paths' and 'vicious sink paths'.

4.7 Innovative Capacity

- The innovative capacity of firms is underpinned by the management of four interconnected dimensions culture, resources, competence and networking. The generic traits that characterise innovators include:
- **Culture:** openness; opportunistic and entrepreneurial; strong commitment to innovation; pragmatism; flexibility; consistent communications.
- **Resources:** founders with good technical training; technology, marketing and development synergy; multi-skilled workforce; up to date systems and tools; pragmatic project screening approach; managers with broad experience.
- **Competence:** idea generation capability; in-house development capability; strong practise of customer co-development; strong customer interface; good knowledge of market opportunities and technological abilities.
- **Networking:** informal networking; formal networking; customers, suppliers and competitors interface; networking with local institutions.

Further details on these findings and the data underpinning them will be provided during the presentation and can be found in Neely and Hii (1999) & Marston, M. and Neely, A.D. (2010).

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Author's Background

Professor Andy Neely holds joint appointments at Cambridge University and Cranfield School of Management. He is also Deputy Director of the Advanced Institute of Management Research, the UK's Management Research Initiative. Previously he has held appointments at London Business School, Cambridge University, where he was a Fellow of Churchill College, Nottingham University, where he completed his PhD and British Aerospace. He was elected a Fellow of the Sunningdale Institute in 2005, a Fellow of the British Academy of Management in 2007 and an Academician of the Academy of Social Sciences in 2008. Andy is widely recognised as one of the world's leading authorities on organisational performance measurement and management. He has authored over 100 books and articles, including "Measuring Business Performance", published by the Economist and "The Performance Prism", published by the Financial Times. He has won numerous awards for his research and chairs the Performance Measurement Association, an international network for those interested in the performance measurement and management. Currently he is researching issues of performance and innovation in service businesses.

Dr. Jasper Hii is a researcher at Cambridge University and Cranfield School of Management. He has actively assisted Prof. Andy Neely in conducting research in organisational performance measurement and management for over 10 years.