New Product Development Processes within the Australian Software Industry

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Abstract

It is widely acknowledged that new product and new service development are critical to the survival and performance of firms today. New Product Development (NPD) research emphasises the importance of employing models that aim to reduce new product risk and increase the likelihood of success. The bulk of this theory comes from traditional manufacturing enterprises, however, more recently researchers have begun to investigate whether these well-established models and NPD practices are applicable to services (Johne and Storey 1998). While there has been a great deal of research into the manufacturing industry, little is known about product development processes within firms that are characterised by high pressure, dynamic markets and intense competition. This research investigates new product development processes within the software industry. This industry has, at face value, very different characteristics from traditional manufacturing firms. Through in-depth interviews with a range of stakeholders in the software industry, this research found that common, linear NPD models are not appropriate in the development of new software. The development of new products was identified as requiring a more iterative and, at the same time, organic or unstructured procedure than that commonly presented in NPD models.

Introduction and Antecedent Studies

The notion of New Product Development is no longer a strategic option; rather, it is a necessity as businesses are faced with intense global competition, shorter product life cycles, major organisational re-structuring and rapid technological developments (Craig and Hart, 1992). Firms that fail to foster innovation will be confronted with static profit growth, changing markets and intense competition that will render their products obsolete (Urban and Hauser, 1993). New product failure rates have been reported as high as 80 to 90 per cent (Hanna, Ayers, Ridnour and Gordon, 1995). Less pessimistic reports, however, suggest that for those products that reach the market, 30 to 40 per cent fail (Barclay and Benson, 1990; Booz-Allen and Hamilton, 1982; Crawford, 1977).

More recent research, however, has focused on comparing new product successes and failures. These studies are based on the premise that factors differentiating successes from failures can only be identified via comparative studies. Several notable success/failure comparison studies include the British SAPPHO (Rothwell, 1972), NewProd in Canada (Cooper, 1979a; 1979b; 1980) and the Stanford Innovation Project (Maidique and Zirger, 1984). Despite differences in methodology and geographic location, these studies have identified consistent factors that distinguish successful from unsuccessful new industrial products. These factors include a market orientation, clear decision points and the use of cross-functional teams (Cooper 1994) and they form the basis of formalised NPD models.

The purpose of employing NPD models is to reduce the risk associated with new product introduction and to increase the likelihood of commercial success through implementation of a step-wise procedure (Crawford, 1997; Lehmann and Winer, 1994; Nijssen and Lieshout, 1995).
Moenaert and Souder (1990) suggest that NPD activities act as discrete information processing units that progressively decrease the level of uncertainty attributed to new product development. NPD models are structured to ensure that the quality and progress of the new product project can be assessed.

The question remains though as to whether on standard NPD process suits all industries and product types. Although most models are very similar, specific models have been developed for goods (e.g. Cooper 1994) and services (Scheuing and Johnson 1989). In this research, the value of standardized NPD processes is recognised, but the focus is on the extent to which industry characteristics influence the applicability of those processes. The research is separated into two stages. The first examines the how the industry perceives itself as different from other industries. The second stage looks at how well standard NPD processes suit the Australian software industry, based on the reported practices of those involved in it.

**Methodology**

New product development research has predominantly been quantitative in nature. The majority of notable studies have used quantitative surveys of large samples to investigate new product development practices. This type of research aims to identify and measure what variables are related to NPD outcomes, with particular emphasis on success criteria (Craig and Hart, 1992). Furthermore, the majority of NPD studies have focused on investigating a variety of industries, in an attempt to gain a general overview of the factors critical to success.

The lack of industry specific research and the uniqueness of some industries provide the justification for investigating new product development processes within the software industry. This research is exploratory by nature, given that little research has focused on NPD practices within software development firms. The aim of this exploratory research is to investigate the unique characteristics that affect NPD within the software industry, rather than to quantify it. The purpose is to develop an understanding about the NPD processes within the software industry in order to provide a clear direction for subsequent research.

This research project is formulated as a qualitative, in-depth exploration into NPD processes within the software industry in line with calls for more qualitative research into this field Craig and Hart (1992). This study follows the precedent established by Boag and Rinholm (1989) and Cooper and Kleinschmidt (1991) who also employed in-depth personal interviews to study NPD processes within high technology and leading industrial firms respectively. The researchers suggested that the complexity surrounding NPD practices required in-depth analysis to capture patterns and findings that a survey could not.

Purposive sampling was used to select a sample of software firms operating within Melbourne. The sampling frame was a CD_ROM called Contacts which is a database compiled by IDG Communications Pty Ltd. The database, which includes a list of information technology firms operating within Australia, allows a search to be conducted to narrow the options. The sampling frame is the result of narrowing the search to a list of software firms based in Melbourne. There are many software firms that do not develop software as part of their business; therefore, the frame was furthered narrowed to software development firms.

The in-depth personal interviews were conducted with a sample of 10 employees from different software companies that develop custom built systems. Damanpour (1992) states that the size and age of a firm are two characteristics that affect a firm’s level of innovativeness and hence its
NPD experience. As a result, the cases are selected on the basis of size and age because these properties are relevant to the topic under investigation. Respondents who participated in the study consisted of persons responsible for product development, such as, marketing managers, project managers, developers and general managers. Interviews were not limited to one type of employee or department because new product development is a multifunctional endeavour. The interviews ran for approximately 60 minutes and were tape recorded to identify patterns quickly, verify viewpoints, and find supporting quotations and avoid biased reporting. The respondents requested that the identity of their organisation was to remain anonymous.

The research explored the new product development processes typically conducted within software firms to determine whether these processes deviate from those stipulated within Kotler’s (2000) NPD model, which is a common NPD model presented in a substantial number of undergraduate marketing courses in Australian universities. The aim is to determine why, if any, deviations from this model exist, and whether these are valid and reasonable or just poor practice. The researchers asked a range of questions specifically linking Kotler’s eight-stage new product development model to the new product processes typically conducted within the software industry. Kotler’s model is comprised of the following stages: idea generation; screening; concept development and testing; marketing strategy; business analysis; product development; market testing; and commercialisation.

**Findings and discussion**

The first stage of this research was to identify aspects of the software industry that respondents felt were unique, and to isolate the impact those unique aspects had on NPD. A selection of the main issues identified in the interviews are summarised in Appendix One, through indicative quotations from individual interviewees. The second stage was to identify the processes by which these firms undertook in NPD and compare these, specifically, to the Kotler model.

**Stage One: Implication of Software Industry Characteristics on Product Development**

The results support the assertion that inherent characteristics within the software industry distinguish it from manufacturing industries. Software appears to have more in common with a service industry, which leads to the question of whether custom-built software is a service, rather than a product. The findings show that software development exhibits many similarities to three of the characteristics that Brentani (1990) states are unique to services: intangibility, inseparability and variability.

Software is largely intangible because the intention of the user is to purchase a solution or a particular outcome. The physical product is of no importance. As Brentani (1990) suggests, the implication of intangibility is that new products can be developed and modified with ease. This notion is supported by the continual upgrades and modifications witnessed within the software industry. Software development, like NSD, evolves, as an ongoing process that alters as clients’ needs change.

Although clients are not present during the production of the software solution, there is evidence of a very close interaction between the buyer and seller. The close contact during the development process enables the software to be customised to suit specific requirements, which is also indicative of services. The findings indicated that the software development process is viewed differently from developer to developer. Programming is considered a craft and the lack of industry standards means that people cannot make assumptions about the way in which
systems function. The outcome of the software solution varies from developer to developer
because the input required for production depends on the type of skill set employed. This
variability evident within software and services raises the issue of standardised practices. It
appears that the software industry is pushing for standards in order to minimise the level of
variability.

If software embodies many of the same characteristics that make services different to tangible
products, it seems appropriate to classify it as a service. Given the similarities between software
and services, one would expect NSD models to be applicable to software development. The
NSD model proposed by Scheuing and Johnson (1989) has followed the same generic process
as NPD. The element that distinguishes the NSD model is the design of the delivery system.
Designing the delivery system is, to an extent, relevant to custom-built software development.
Essentially, the software firm is providing the client with a solution, not a tangible product. The
client is purchasing knowledge and expertise therefore it is a provision of a service. The aim of
the software firm is to design the way in which it will deliver this knowledge to the customer.

Despite this, Scheuing and Johnson’s (1989) NSD model follows the same process as Kotler
and many other NPD models. The respondents indicated that the NPD generic process is not
suitable to firms that develop software. This suggests that the processes prescribed in both NPD
and NSD models do not fit the development process typically conducted by software firms.

NPD and NSD models focus on testing the new idea prior to commercialisation. Within the
manufacturing and service industries, the cost of building a working prototype and testing its
validity and acceptance in the market is very low relative to the ongoing costs required to start
full-scale production. As a result, the NPD processes within both sectors are devised to ensure
that the product or service has been extensively tested, prior to launch, to determine whether the
project will go ahead. As emphasised throughout the literature, this reduces the risk of wasting
large amounts of investment required to produce and maintain the product or service. Firms
have the ability to postpone or cancel the idea without incurring substantial costs.

The development of custom-built software does not appear to follow Kotler’s NPD model or the
model proposed by Scheuing and Johnson (1989). Software product ideas are generated and
conceptualised with a specific user in mind. Once the customer has evaluated the new product
idea and agreed to implement the system, construction of the product begins. The firm has
entered into a contract with the buyer to supply the proposed system, therefore actual full-scale
development commences at the construction stage. Unlike traditional manufacturing and
service firms, companies that provide custom-built software do not develop the product, test it
in the market and then decide whether to proceed with the idea. Firms that develop custom
made software systems do not need to test it in the market prior to launch because they are
delivering a product that is customised to a client’s specific requirements, thus market
acceptability is a given.

Kotler’s NPD model also does not account for the customisation element evident within
software development. Software firms need a NPD process that enables the firm to delay
commitment to a final design as late as possible. This ensures that any new information can be
used to make rapid adjustments to the final product.

Respondents emphasised the problem associated with employing a development process that is
conducted sequentially. It is could be the case that software firms, which complete NPD stages
sequentially, risk developing obsolete products that fail to meet customer needs and exploit new
technologies. It is vital that software development occurs as an iterative process, rather than sequential, to reduce time to the market. This supports Takeuchi and Nonaka (1986) and Crawford’s (1997) view of performing NPD activities simultaneously. They suggest that NPD stages should overlap to deal with increasing time pressures, which is extensively supported by the findings. The benefits associated with being first to the market encourage NPD processes that shorten delivery times.

**Stage Two: Applicability of the Kotler NPD Model**

The respondents indicated that the idea generation, idea screening, concept development, marketing strategy and business analysis stages were practiced during the software development process. Despite the apparent relevance of the product development and market testing stages, the respondents indicated that these were not practiced within software development firms. Furthermore, the respondents suggested that commercialisation was not relevant to firms that develop custom built software because it is not launched into the market and made available to all customers. Commercialisation, therefore, was difficult to identify as a discrete stage, given that the consumers had been using the prototype and advances on it, all along.

A software product is developed with the intention of being launched into the market. Respondents indicated that their software firms would not engage in construction of the product and then decide not to proceed with it. This is due to the high investment required to develop the initial product relative to other products. The software firm tests the new product concept early in the discussion with the client. Furthermore, if there are problems with the product after deployment, it is easy to make necessary changes and rectify the problem once the system has been installed.

The respondents emphasised that software firms require a new product process that is characterised by flexibility and shorter NPD cycle times. Time pressures govern these firms in order to introduce new products ahead of competition. The respondents indicated that a sequential approach to NPD is inefficient for firms operating within turbulent and unpredictable business environments. The findings support the proposition that certain characteristics of the software industry make it different from traditional manufacturing firms, and thus affect product development processes.

**Conclusions and Future Research**

Research studies have demonstrated that adherence to formal NPD models improves the likelihood of developing successful products and services. The key question is whether the respondents are justified in their rejection of these models for software development. There are certainly idiosyncrasies within the software industry that make it unique. The research findings and literature on the software industry has shown that certain elements within the industry affect product development. The rejection of Kotler’s traditional NPD model by those who participated in the study was not based on any specific theoretical grounds, rather it was the respondents’ previous experience and technical skills in software development, rather than marketing, that influenced the process followed in NPD. As such, this research is not able to conclude that traditional NPD and NSD models would not be advantageous in the development of software. These models are not rejected by software firms in any deliberate strategy, rather the software firms that were involved in this research had developed their NPD strategies iteratively and therefore further research in firms that do employ a version of these models would be required to draw a distinction.
Despite this, the results of this research project highlight that software development is a unique endeavour. There are characteristics indicative of software development that requires different NPD practices. The implication of this finding is that certain new product development practices and processes may be industry dependent. Formal NPD processes may need to be modified and adapted according to the nature of the industry, providing support for further industry specific research. A more iterative model, as presented below in Figure One, might be more appropriate for this particular industry.

**Figure One: New Product Development Model in Software Industry**

**PHASE ONE: CONCEPTUAL**

- Idea Generation
- Idea Screening
- Concept Development
  - Marketing Strategy
  - Business Analysis

**PHASE TWO: PRACTICAL**

- Prototype Testing
- Construction
- Deployment

**Appendix One: Unique Aspects of the Software Industry as identified by Interviewees**

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<th>Unique Aspect</th>
<th>Illustrative Quote</th>
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<td><strong>1. Knowledge Based Endeavour</strong></td>
<td>“Physical Assets like plant and equipment within software are negligible … people can get hold of a CD of your software and they’ve got everything you’ve got.”</td>
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<td><strong>2. High Labour Intensity</strong></td>
<td>“The software industry is largely labour intensive, so you don’t have large set-up costs. Anyone with a good idea can set up a software company”</td>
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<td><strong>3. The Importance of Entry Time</strong></td>
<td>“The difference between being first in the marketplace or last could only be a matter of weeks, but the impact on your company could be catastrophic. You have to be there at the right time and with the right product.”</td>
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| **4. Lack of Industry Standards** | “We need to get standards about the way we do things in the software industry. In the construction industry you have 100 years of building regulations and standards-in software we rely on unique skill that are different from developer to developer. We
need standards so that you hire a developer that will be able to provide some return on investment.”

| 5. Ongoing Buyer-Seller Relationships | “Clients keep changing their minds about what they want and they are under pressure from globalisation. So once you put a system in and build the core structure, nine months later you have to build another version of it. Our systems and new product processes have to be able to accommodate this.” |
| 6. Importance of Innovation | “Innovation is vital, there is no question about it. Software is one of those things that will continually move and move. If someone gets the upper hand they can render products obsolete overnight. Software firms are constantly trying to build better products with greater functionalities.” |
| 7. Customisation of Standard Platform | “Our core business is to sell platforms, solutions and upgrades and that gives us continuous revenue…but on top of that we have this whole opportunity area where our sales guys use customer relationships to focus on where new product activities should be heading.” |

References


Rothwell, R. (1972). "Factors For Success in Industrial Innovations", from *Project SAPPHO-A Comparative Study of Success And Failure in Industrial Innovation*. Sussex: S.P.R.U

