The Roles of Management Control in a Product Development Setting

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Abstract

Purpose – This paper examines the ways in which management control is enacted in a product development setting to provide new insights into the different roles that control can play in this context.

Design/methodology approach – We carry out a nine-month in-depth field study at a subsidiary of an Australasian multinational firm which operates in the consumer foods industry. We use a participant observation approach to collect field notes and documents from the organisation which we analyse through the lens of ethnomethodology.

Findings – Our results indicate that the role of management control during product development is mainly focused on reducing uncertainty at the stages and promoting goal congruence at the decision gates. We argue that this helps explain why management control has a positive effect in a product development setting.

Research limitations/implications – The implication of this finding is that the role of management control changes during product development due to the involvement of different organisation members (communities of practice) and the activities that they carry out. This helps us build a more holistic understanding of control in product development. As this is a field study of a specific company our findings are not generalisable to other companies or settings. Future research also needs to investigate other possible roles which management control may play in this context.

Originality/value – We extend the research in this area by showing how and why management control can take on multiple roles in practice.

Keywords – Management control, Product development, Ethnomethodology, Uncertainty reduction, Goal congruence

Paper type Case study

Introduction

> "Today's effective product development organization is characterized not only by creativity and freedom, but also by discipline and control… The challenge in product development is not so much unilateral pursuit of organic structure and permissive management style as a subtle balance of control and freedom, precision and flexibility, individualism and teamwork."
>
> Clark & Fujimoto (1991, p. 169)

Global competition and technological development have shortened product life cycles substantially (Cooper, 2005), placing greater emphasis on the development and successful introduction of new products. Indeed, this has become a significant driver of competitive advantage (Booz *et al.*, 1982; Cooper, 2001; Kumar and Phrommathed, 2005). Many organisations now view their product development activities as the "new currency of competition… the key to organic growth, the lever to widen profit margins, the Holy Grail of 21st century business" (Conlin, 2006, p. 19).

While creativity and freedom can be said to stimulate and encourage product development, considerable resources need to be managed and a number of decisions made (Clark and Fujimoto, 1991; Davila *et al.*, 2006). Further, product costs become locked-in as a product is developed (Hertenstein and Platt, 2000). Once the organisation has introduced a product, it becomes more difficult to substantially reduce its cost (Blanchard, 2008). It is therefore in the organisation's interests to manage or control these costs and risks at or close to the time at which the related activities take place (Davila and Wouters, 2004). It also appears that the tension between creativity and control varies depending on the extent to which new products diverge from existing products, knowledge, technology and marketing expertise (Rice

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et al., 1998). There is said to be less tension between creativity and control where product development involves incremental rather than radical innovation (Rice *et al.*, 1998).

Most of the research on management control in product development has focused on the attainment of organisational goals (Bonner *et al.*, 2002; Hertenstein and Platt, 2000). Davila (2000), though, showed that management control in product development also provides information to managers to reduce uncertainty.

This paper examines how an organisation enacted management control during the development of new products to both increase goal congruence and to reduce uncertainty. We add to the research to date by showing why management control can be useful in a product development setting. Our focus is on the involvement of members from different hierarchal communities during the activities carried out at the stages and gates of the development process. We hope that our findings can also assist managers engaged in product development by highlighting how management control can be enacted in ways that both reduce uncertainty and increase goal congruence.

We take Davila (2000) as our reference point because the Davila (2000) study is the only study in this area of which we are aware area that focuses on the uncertainty reduction role of control. Davila (2000) examined both financial and non-financial control, following Simons (1995) who showed that managers use both financial and non-financial control in practice. There are several points of departure from Davila (2000) in the current study. Davila (2000) assumes that the main role of management control during product development is the reduction of uncertainty, whereas we make no assumptions *a priori* and set out to deduce the roles of management control from observations of organisation members during product development. Davila (2000) collects his data through a series of interviews and he

conducts a quantitative analysis of this data. In the current study we adopt an ethnomethodological (and qualitative) approach (Garfinkel, 1967; 2002; 2006; Rawls, 2002; 2006) in which there are no preconceptions regarding the nature of management control.

We collect our data by observing product development and management control activities for subsequent analysis. Davila (2000) recognises goal congruence as a prominent role of management control, but argues that uncertainty reduction is its main role in product development. In seeking confirmation, he examines one stage in the product development process for evidence of the uncertainty reduction role but does not seek any indication of the goal-congruence role. By contrast, we observe five stages and four gates of the product development process in the current study. Davila (2000) restricts management control to formal control (see for example; Simons, 1995) whereas this restriction does not apply to the current study.

We contribute to the literature by showing how control both encourages goal congruence and helps to reduce uncertainty. Thus, we show how a balance between goal congruence and uncertainty reduction are important in a product development setting. We show that this is accomplished by having different communities of practice involved at different times during product development. This paper thus adds to the growing body of research showing how management control can have a positive effect in a product development setting (Bisbe and Otley, 2004; Bonner *et al.*, 2002; Davila, 2000; Davila *et al.*, 2009; Hertenstein and Platt, 2000; Jørgensen and Messner, 2009). Finally, we show that management control may take on similar roles in firms pursuing both incremental and radical product innovation. This finding was not expected given that past literature has found that incremental and radical projects are managed differently (Akroyd *et al.*, 2009; Davila *et al.*, 2006; Rice *et al.*, 1998).

We conduct an in-depth longitudinal nine-month field study to afford a close-up view of the roles of management control in a product development setting. The research site is an operating company of a large Australasian multinational company within the consumer foods industry. We examine eight projects within a single business unit called *OpCo* (a pseudonym). Given that product development is a multi-disciplinary activity, this approach enables us to follow interactions between the members of different functional departments and hierarchal groups within the organisation.

The remainder of this paper is structured as follows: The next section presents our theoretical perspective and the literature relating to management control in product development. The following section focuses on the research methodology. We then draw the case data from our observational notes and present them for each stage-gate combination, followed by a discussion of the insights gained at each point. We conclude with a summary of the findings, limitations and future research directions.

Theoretical perspective and literature review

Our theoretical perspective is based on practice theory. According to Stern (2003, p. 185), practice theory is "any theory that treats practice as a fundamental category, or takes practice as its point of departure." Practice theory involves "an emphasis on the importance of close attention to particular practices and the context within which they are located." Stern (2003, p. 185) points out that practice refers to "something that people do, not just once, but on a regular basis" and moreover, to "the significance their actions have and the settings in which they occur." Practice theorists generally avoid formal hypotheses that generate explanations or predictions.

Garfinkel (2002) refers to his approach to practice theory as ethnomethodology, which he describes as the study of ethnomethods; that is, locally produced and situated practices of organisation members as they engage with and make sense of the world around them. As they do this, their actions influence the "scene" or "setting" which provides the context of those actions. As Rawls (2002) puts it, ethnomethodology focuses on an examination of what people do in particular situations to create and re-create order.

We adopt a practice theory perspective, as expressed through ethnomethodology, to investigate the activities in which members of different 'communities of practice' participate during product development. Wenger (2004, p. 2) defines communities of practice as "groups of people who share a concern or a passion for something they do, and who interact regularly in order to learn how to do it better." While much of the literature in this field focuses on informal communities of practice, it also recognises formal communities of practice (see for example; Brown and Duguid, 2001). Formal hierarchical communities of practice within an organisational setting feature in this paper.

Jönsson and Macintosh (1997, p. 367) argue that ethnomethodology could be a "valuable way to understand the way accounting works in actual organizational settings." However, the pure application of ethnomethodology, eschewing hypotheses and predictions as it does, is at odds with mainstream management accounting research. In view of this and recognising the admonition that ethnomethodology needs to be "induced to work more closely to current theoretical discourses," (Jönsson and Macintosh, 1997, p. 367), we place the current study in the context of the management control literature, state its aims and evaluate the findings.

Management control

Anthony (1965, p. 17) developed an early definition of management control as "the process by which management ensures that resources are obtained and used effectively and efficiently in the accomplishment of the organisation's objectives." Implicit in this definition is the pursuit of goal congruence, which Horngren *et al.* (2009) argue "exists when individuals and groups work towards achieving the organization's goals. Managers working in their best interest take actions that align with the overall goals of top management."

Other researchers (see for example; Bonner *et al.*, 2002; Flamholtz, 1983; Flamholtz *et al.*, 1985; Hertenstein and Platt, 2000; Ouchi, 1979) share this focus. They point out that management control provides a means for gaining cooperation among collectives of individuals or organisational units who may not share objectives, for channelling those efforts toward a set of organisational goals.

According to Davila (2000, p. 386) past studies "interpret these [management control] systems as control tools to reduce goal divergence [i.e. to promote goal congruence] rather than as information tools to deal with uncertainty." Based on the product development literature Davila (2000) argues for an alternative role for management control that is, to provide information to managers to reduce uncertainty. He maintains that as managers gather and communicate information management control takes on an uncertainty reducing role during the product design stage.

In a product development setting, goal congruence is related to the strategic and financial goals of the organisation (Hertenstein and Platt, 2000). On the other hand managers also focus on reducing the uncertainties that they face in a product development setting. According to November (1993, p. 16) some of the typical uncertainties faced are – "Who will buy this product? What is the patent situation?

How much can we sell the product for? How much will it cost to manufacture? What are our competitors doing? Where can I buy supplies of raw material? How large should the first production [run] be? These uncertainties are reduced over a period of time by spending money on information accumulation."

Management control in a product development setting can be understood through three core control concepts – input control, process control, and output control. These link together to enable organisation members to enact management control (Bonner *et al.*, 2002; Long *et al.*, 2002; Merchant, 1985; Simons, 2000). Input control is accomplished when decisions are made about the amount of resources necessary for developing and launching a product (Bonner *et al.*, 2002). In particular, human resources are said to be a central focus of input control in a product development setting (Brown and Eisenhardt, 1995).

Process control is also critical in the development of new products (see for example, Bisbe and Otley, 2004; Cooper, 2005; Davila, 2000; Davila *et al.*, 2009; Hertenstein and Platt, 2000; Wheelwright and Clark, 1992). According to Krishnan and Ulrich (2001, p. 1) the product development process involves the "transformation of a market opportunity and a set of assumptions about product technology into a product available for sale." Cooper (1994) suggests that the product development process has had a profound impact on the way in which many organisations' development efforts are managed, controlled and measured. Product development activities can be divided into stages and decision gates (Cooper, 2001). The stages include the generation, scoping and selection of new ideas, business case planning, and the development, testing and validation of the product concept. At the gates senior managers carry out project screening and project reviews based on key milestones and project issues which are used to make decisions about the projects in

which to invest. Thus, we view process control in relation to the activities that take place during the stages and gates of the product development process.

Output control is also important in product development (Bonner *et al.*, 2002; Jaworski *et al.*, 1993; Li *et al.*, 2006). This is accomplished when information is collected and analysed, key indicators are "set and monitored and results evaluated" (Li *et al.*, 2006, p. 338) based on the progress and outcomes of product development projects (Bonner *et al.*, 2002). In this paper we view output control in relation to the collection and analysis of information and the monitoring and evaluation of key indicators.

Using these three management control concepts we show how the two roles of management control are enacted thus contributing to our understanding of how and why management control matters in this setting. We examine the enactment of these two roles of management control by describing and analyzing our observations of product development at our case site - *OpCo*. As *OpCo* differentiated its product development projects between those with different technical and business model attributes we examine different project types to see if this could explain the reason why management control may take on different roles.

Project types

It has been argued that a key variable in product development is the type of product development project. The two attributes that define project development types are technology and business models (Davila *et al.*, 2006). While new product or manufacturing process technology is clearly central to innovation, a business model which "describes the rationale of how an organization creates, delivers, and captures value" is also a central requirement for innovation (Osterwalder *et al.*, 2010, p. 14).

The relative effort required in relation to these two attributes depends on the type of product development project.

Rice *et al.* (1998, p. 52) observe: "what is sound management practice for incremental innovation - where speed, cycle time, and quick cash recovery are primary objectives - might actually hamper the radical innovation's progress." Incremental projects are close to the firm's current product range and thus reinforce prevailing market structures and competitive positions and strengthen existing barriers to entry (see for example, Abernathy and Clark, 1985; Iansiti, 1995a; Iansiti, 1995b). According to Ettlie and Subramaniam (2004, p. 97) incremental innovations "are a result of refining prevailing knowledge" while radical innovations "arise because prevailing knowledge gets transformed." Iansiti (1995a, p. 38) suggests that when managing incremental projects, organisations need to make sure that the

> "focus is on developing a structured process with clearly defined and sequential phases, through which the future product is defined, designed, transferred to the manufacturing plant, and rolled out to the market. Performance is related to mechanisms that add clarity and stability to the project, such as a clear project definition phase as well as a stable product concept and specification. The emphasis is on a process aimed at achieving focused and efficient project execution, involving strong project leadership, integrated problem solving and team-based organisational structures."

Radical projects, on the other hand, are quite different from a firm's current products because they include both new technology and a new business model. These projects are generally characterised as having long time horizons, starts and stops, and periods of seemingly going nowhere. Through a collaborative research project of the Rensselaer Radical Innovation Research Project Team and the Research-on-Research Committee of the Industrial Research Institute, Rice *et al.* (1998) come to the conclusion that conventional management techniques that are suitable for incremental projects may not be suitable for radical projects until uncertainty is sufficiently

reduced. Iansiti (1995a) points out that in cases where much new technical and market information will emerge during the typical timeline of the project the emphasis should shift from the capabilities for focused and rapid project execution to the capabilities to react to newly discovered information during the course of the project itself. Consequently, the development process should be characterised by flexibility and responsiveness so that the people involved in the project have the ability to gather and respond to new knowledge about technical and market information as a project evolves. Iansiti (1995a, p. 38) adds that

> "the flexible approach is not simply a function of hiring creative individuals or of implementing an organic organisational structure. Instead, significant systematic changes in a project's definition and basic direction are managed proactively by creating a development process and a product architecture that increase the speed by which the organisation can react to such changes."

Davila, Epstein and Shelton (2006) illustrate different project types in a matrix. These are based on changes in technology and business models (see Figure 1).

Insert Figure 1 Here

Davila *et al.* (2006, p. 39) observe that it is important to understand the differences between projects so that they can be "managed, funded and resourced appropriately". This understanding may also explain variations in the role of management control according to project types.

Research Methodology and Method

As mentioned above, this is an ethnomethodological study (Garfinkel, 1967; 2002; 2006; Rawls, 2002; 2006), that is, it focuses on "members' methods based on the theory that careful attention to the details of social phenomena will reveal social

order" (Rawls, 2002, p. 6). According to Laurier (2003, p. 1) studies of this type are interested in "the relation between practices and accounts of those practices…how things get done by members of particular settings with the resources they have at hand."

An ethnomethodological study calls for an insider's perspective. This requires that the researcher gain 'unique adequacy' (Adler and Adler, 1987; Garfinkel, 2002) because s/he must be seen as a competent practitioner at the field site (Garfinkel, 2002). To achieve unique adequacy the first-mentioned author (the researcher) spent four months at the head office of the field study firm undergoing product development training. Participant observation in the activities at the field site allowed him to follow and observe organisation members in a way that might not otherwise have been feasible. According to Adler and Adler (1987) access to 'secret' information reinforces the researcher's membership of a community.

Adler and Adler (1994, p. 377) define participant observation as "the act of noting a phenomenon, often with instruments, and recording it for scientific or other purposes." Thus, studies using a participant observation method are interested in "going where the action is and watching and listening" (Bøllingtoft, 2008, p. 406). For a researcher, observation is concerned with systematically recording, describing, analysing and interpreting our observations of the individuals we follow (Adler and Adler, 1994; Bøllingtoft, 2008).

Adler and Adler (1987) set out three levels of participant observation in a field study. Those who attain the highest level of participant observation are called 'complete members' as they take on functional roles within the organisation and are not known as researchers at the field site. Adler and Adler (1987) argue that this enables a researcher to attain emotional and ideological alignment. Researchers at the

second level of participant observation are called 'active members', as these researchers assume functional roles but are able to maintain perspective on their settings by carrying out debriefing sessions with colleagues. Finally, researchers at the lowest level of participant observation scale are called 'peripheral members' as they do not assume a functional role within the organisation. The peripheral level of observation nevertheless affords unique adequacy and calls for significant assimilation within the communities of practice.

The first author was a peripheral member within the different functions and hierarchal communities at *OpCo*. This provided observational access to each function and community in the hierarchy, which enabled an understanding of how members of the organisation carried out their work. It allowed enough distance to observe different communities of practice. At the same time, there were opportunities to participate in many of the support activities of the different communities during the product development process.

Research method

Otley (2001, p. 256) calls for more field research in management control as "intensive, field-based methods are much more likely to pick up on the wide variety of control mechanisms deployed by organizations in practice." We select a field site that is active in the development of new products to facilitate examination of the roles of management control during product development. AusFood (a pseudonym) is a multinational Australasian food company, one of the largest in Australasia and a global leader in the food industry. AusFood has assets of AUS$5 billion with an annual turnover AUS$12 billion. It sells its products in 140 countries and has an R&D centre for inter-company research along with R&D centres at each operating

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company. Owing to the size of AusFood we concentrate on one of its operating companies - *OpCo*.

We conduct a field study, which facilitates a peripheral member's and an insider's view. We examine product development projects within an organisation called *OpCo*. Given that product development is a multi-disciplinary activity, this approach enables us to follow interactions between the members of different functional departments and hierarchal groups within the organisation. The researcher collected the field material reported in this study over a nine-month period from November 2004 to August 2005, amounting to 113 observation days. During these visits he made field notes (the main data source for this study) of the observations of project selection meetings, product development meetings, functional and executive manager meetings, and other discussions related to product development activities (see Table 1)

Insert Table 1 Here

Product Development and Management Control at *OpCo*

We chose *OpCo* for the study because it was active in product development. *OpCo* had released many successful new products and had also patented some highly innovative manufacturing processes. Not only was *OpCo* a successful innovator but it was also the market leader in every category in which it competed. It had 14 competitors in the local market including the worldwide market leader, thus making for a highly competitive market place.

OpCo's structure

OpCo's structure consisted of three communities of practice (see Figure 2). The top management community comprised executive managers that we refer to as the "executive manager" community. This included the Chief Executive Officer (CEO), Chief Financial Officer (CFO) and the General Managers (GM) of the five functional areas; human resources, sales, technology, operations and marketing.

Insert Figure 2 Here

Each of the general managers had three or four functional managers reporting to them. This second management community, that we call the "functional manager" community, comprised managers from the technology, marketing, sales, operations, finance and HR departments as well as the business process manager who reported directly to the CEO. Between three and six staff members in that function reported to these managers and we call this the "functional specialist" community. During nine months at *OpCo* the first author was a peripheral participant in *OpCo* and directly observed 31 organisation members including all 7 executive managers, 11 functional managers and 13 functional specialists (see Table 2).

Insert Table 2 Here

OpCo's categorisation of projects[1]

OpCo categorised its projects into one of four categories (in a similar way to the model of Davila *et al.*, 2006 as shown in Figure 1). The first category of projects was incremental in nature as the focus of these projects was on maintaining the base

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[1] AusFood "NPD Process and Priorities" page 22

and improving existing products. As such the technology and business models used for these products were expected to be close to the firm's current product range. The most innovative projects were radical in nature as the aim was to introduce new products into new markets. This usually involved both new technology and new business models. Finally there were two project categories that could be called 'semi-radical'. One consisted of projects using existing technology with the aim of offering a product in a new market (which often required a new business model). The second category of 'semi-radical' projects used new technology but was aimed at an existing market. Table 3 shows the projects observed as well as the project type as determined by *OpCo*, the project development time from idea generation to launch and the outcome of the project.

Insert Table 3 Here

OpCo's product development process was typical (see Figure 3), with five stages and four gates (see for example Cooper, 2001; Crawford and Di Benedetto, 2006; Ulrich and Eppinger, 2000).

Insert Figure 3 Here

The rectangles and the diamonds in Figure 3 represent the stages and the gates or decision points within the product development process respectively. During the stages the functional manager community was responsible for directing the activities that needed to be carried out. At the gates the executive manager community made decisions about which product ideas to continue investigating

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The first half of the process started with the generation of new product ideas and ended when projects passed through the project screen gate. In the product development literature this is known as the "front end" of innovation and it has been argued that this creates the foundation for successful new products (Poskela and Martinsuo, 2009).

The second half of the product development process at *OpCo* covered the stages from product feasibility to market launch. During this part of the process the functional manager community organised project teams to take projects from the design and testing stage to launch. At the gates functional managers presented project updates to the executive managers who reviewed the progress of projects and decided if they would continue onto the next stage.

The following sub-sections cover the stages and gates followed during the product development process. While all projects neither went through every stage of the process nor in exactly the same order, the description is representative of the process that *OpCo* projects followed. In describing the product development process, we commence by describing the activities at stage 1 and gate 1, followed by a discussion of the activities at this stage and gate, before considering stage 2 and gate 2 of *OpCo's* process.

Stage 1 - Idea Generation Activities

Products originated in the idea generation stage which started with organisation members examining recent consumer trends in local and international markets.[2] This included the collection of product samples from around the world as well as internet searches to identify products that other companies had been launching.

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[2] Field note (office conversation) Friday 28th January 2005

The purpose of this activity was to understand the product categories most likely to yield successful new products. Functional managers allocated this activity a significant amount of time, as they argued that "without a good understanding of the marketplace the product development process would not have any focus."[3] In this context 'focus' meant having a good understanding of recent market trends in the food industry, which enabled them to say where new product ideas might come from.

Using the market information gathered the functional managers focused on eight themes[4] that they thought represented promising areas to develop new products. These eight themes were documented and given to functional specialists to examine in more detail. Functional managers referred to these eight themes to plan idea generation activities such as brainstorming, ideation, presentations and laboratory activities. Some of the projects came from the brainstorming and ideation activities while other projects originated from ideas discussed during presentations and laboratory activities. Until a formal project brief was put together in stage two the information related to these activities was communicated around the organisation through informal discussions.

Ideas about these key market areas were further developed during brainstorming sessions held at the company over a three week period.[5] These brainstorming sessions included both internal employees and members of various consumer groups.[6] The brainstorming sessions produced about 500 ideas which were presented and analysed at an ideation[7] session. This activity included some executive managers, functional managers and functional specialists.[8] The participants vote for

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[3] Field note (office conversation) Friday 26th November 2004
[4] Field note (office conversation) Friday 26th November 2004
[5] Field note (office conversation) Friday 26th November 2004
[6] Field note (office conversation) Wednesday 8th December 2004
[7] Ideation is used to get individuals to produce new collaborations and developments (Day *et al.*, 1994)
[8] Field note (ideation session) Friday 10th December 2004

their three favourite ideas which resulted in a list of 40 product ideas. These were entered into a spreadsheet for presentation at the idea screening gate.

Other projects originated from presentations or work taking place in the technology laboratory. For example, a radical project, the ST project, came from a regular laboratory procedure. During this procedure some functional specialists noted that a product sample had been prepared incorrectly. They were interested in the consequences of this mistake; this led them to further investigate the idea, which resulted in the ST project. During the next month different functional specialists experimented with the idea. Based on these experiments a functional manager submitted a patent for the idea and then organised a meeting to discuss the idea with the executive managers[9].

Gate 1 - Idea Screen

The idea screen focused on ranking new product ideas and involved organisation members from across the different functions and management communities at *OpCo*.[10] It involved two executive managers and, seven functional managers from the technology, marketing, sales and engineering departments. This activity started with the facilitator emphasising that "potential product development project ideas need to be consistent with [*OpCo's*] vision [specific details] and objectives [specific details] as set out in the strategy pyramid."[11] To evaluate the ideas on the project list the facilitator presented a set of five dimensions to the group. These dimensions were: revenue/market share potential, cost and complexity, wow factor, brand alignment, and time to market. The group discussed each of the forty product ideas which had come out of the idea generation stage in relation to these dimensions.

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[9] Field note (project meeting) Friday 28th January 2005
[10] Field note (portfolio meeting) Thursday16th December 2004
[11] Field note (portfolio meeting) Thursday16th December 2004

OpCo formed project teams for 15 of these projects. These project teams included both functional managers and specialists with a representative from each functional group (marketing, sales, technology, operations, and finance).

Stage-Gate 1 - Discussion

During the first stage and gate all three communities – executive managers, functional managers and functional specialists generated new ideas. The members of the three communities then selected the best ideas for further consideration.

During the first stage the functional managers focused on collecting and understanding the market and technical information. They viewed these activities as an important learning exercise. While it did not help them to reduce uncertainty about the ideas they had generated, it did help them to reduce uncertainty about the market segments they were targeting. For example it helped them answer the questions – who will buy this product? And what are our competitors doing? This can be seen during the brainstorming activities when functional managers together with functional specialists and consumers worked together to produce new product ideas related to specific market themes - thus reducing uncertainty about who would buy the product. In other brainstorming activities functional managers used packaging samples to better understand possible product concepts – which helped the managers understand the kinds of product functionality competitors were supplying. At the conclusion of these activities all three communities jointly selected 40 product ideas to be discussed in further detail at the idea screen gate.

During the idea screen gate the executive and functional managers ranked the 40 proposed new projects using five dimensions that linked to the organisation's goals. The organisation members used the ranking dimensions to link their goals to

the goals of the organisation. The purpose of the activity was to ensure that the projects chosen matched *OpCo's* strategy and objectives. The highest 15 ranked projects, based on *OpCo's* ranking criteria, were then given to the functional managers to allocate to their specialists to write into project briefs.

Stage 2 - Project Planning

Following the idea screen gate, the functional specialists wrote up project brief documents for each of the 15 projects selected.[12] Project briefs broadly defined the type of product to be developed and also provided a signal to all the functional departments of the firm that resources would soon be needed. According to one functional manager the aim of this activity was to get "Technology and marketing members together so as to increase communication and understanding between the two groups."[13]

At the start of this stage a cross-functional meeting was organised. One of functional managers started the meeting by summarising what had happened at the idea screen gate. The projects were then assigned to teams of two people consisting of one technology functional specialist and one marketing functional specialist who worked together on a project brief. The project brief contained basic information such as the project's name, originator, proposed launch date, the project manager and project background. This background included information on the consumer insights that had been generated, consumer need, market dynamics, project deliverables, brand requirements, the product concept, estimated sales, financials and manufacturing issues.

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[12] Field note (portfolio meeting) Friday 17th December 2004
[13] Field note (project meeting) Friday 28th January 2005

Gate 2 - Project Screen

Once a project had gone through the planning stage it was registered by the Project Management Office (PMO)[14] and went onto a project list which was presented to the executive managers for evaluation. These initial presentations were given by functional managers at weekly executive meetings. Examples of these discussions are given below.

One of the presentations observed was for an incremental project. The focus at this project screen presentation was on the financials and deciding if the firm had the resources to do the project.[15] A functional manager started the presentation with a list of financial indicators which included project revenue and profitability as well as expected market share gain. During the presentation the functional manager used the information collected by the functional specialists during the product planning stage to support their expectations. Following the presentation the discussions centred on financial indicators. While some of these financials had to be met (such as gross margin) others were open to debate. The executive managers then set project expectations that they wanted to be achieved before this project could continue.

The focus of a semi-radical project presentation observed was on the strategic fit with the firm's priorities and the resources available to carry out the project.[16] A functional manager started this presentation with a market research report and the reasons why the firm needed to develop the product. She then got some project samples delivered from the technology laboratory. While the participants sampled the product they discussed project issues for the radical component of the project. Finally the functional manager presented the financials, such as projected revenue and

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[14] *OpCo* PMO Document September 2004
[15] Field note (executive meeting) Monday 4th July 2005
[16] Field note (executive meeting) Monday 23rd May 2005

profitability, even though they stated that these numbers were hard to compute for the project at this stage. The executive managers then had a discussion on who would be able to work on the project.

During these project presentations the executive managers seemed to be interested in two issues: (1) Will the project help the firm achieve its goals? (2) Does the firm have the resources available to do the project? For executive managers the resource and goal issues seemed to be connected. They often stated that it was important not to have functional managers and specialists working on too many projects as this would slow projects down. This in turn would lead to project time overruns and late product launches which they said would lower the new products' success rate and negatively affect the firms' ability to reach its goals. Because of this executive managers always challenged the workloads of functional managers and specialists to make sure that these people did not have too many projects in progress at any one time.

Stage-Gate 2 - Discussion

During the second stage and gate the organisation aimed to get more information about the product market and a better understanding of the technical issues they might face producing the new product.

During the project planning stage functional managers and specialists wrote up project briefs which they used to collect relevant market and technical information. In particular the functional managers wanted to know - How much can we sell the product for? And how much will it cost to manufacture? Thus, uncertainty was reduced through a better understanding of the market and manufacturing issues they might face.

During the gate the functional managers presented project reviews to the executive managers to make sure that the projects they were planning added value to the firm and could get the resources they needed so that *OpCo* could reach both its short-term and long-term strategic and financial goals. During this activity the managers used the project initiation document as well as project scoring sheets when discussing important project issues.

The two radical projects did not go through this stage or gate but went straight to stage three - product feasibility. The output of this stage and gate was a list of 13 projects which were ready to proceed to the product feasibility stage. This included two radical, three semi-radical and eight incremental products.

Stage 3 - Product Feasibility

This stage started when executive managers added projects to the active project list. Functional managers and specialists carried out four main activities at this stage. These included the writing up of detailed product concept briefs, the development of product formulations and packaging samples, and the design of a production feasibility plan.

Once a product idea had passed through the project screen at Gate 2 the functional managers took the lead in preparing concept briefs. In order to complete these briefs functional specialists from the marketing, sales and technology departments assisted the functional managers. According to a functional manager "The key questions are: Does the project fit into our plans? And, is there someone who can do it?"[17] The concept brief document was designed to get the functional communities of practice discussing critical aspects of the project and included

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[17] Field note (project meeting) Friday 28th January 2005

sections on the project details, purpose, strategic intent, product specifications, resources, product attributes and benefits, and financials.

Functional specialists in the technology department were then assigned the task of experimenting with different possible product formulations.[18] These specialists first searched for materials that could be used in the product. This required the assistance of ingredient suppliers to find the materials that would suit the product. Once materials had been sourced and delivered the functional specialists started making product formulations. This was done in the technology laboratory which was situated below the technology office. The technologists tested different ingredients and often made samples of the product in the pilot plant to simulate production conditions. During this time the functional specialists would invite the executive and functional managers to visit the technology laboratory. According to one technologist, the reason for getting the executive and functional managers to sample the products was that "Getting buy-in of a wide range of people is very important at this stage of the process."[19] As many executive and functional managers came from outside the technology department they could not understand the product test results so the only way to communicate to them was through product samples.

Along with product formulations, functional specialists in the technology department were also responsible for the design of packaging for new products.[20] For incremental and semi-radical projects packaging solutions usually came from either the current product or from packaging already in use in the market. For these projects current packaging was often used as the base for the new product. In these cases members of the technology department would search for a packaging solution from something already in the market. This usually required some interactions with

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[18] Field note (project meeting) Wednesday 22nd June 2005
[19] Field note (project meeting) Wednesday 22nd June 2005
[20] Field note (project meeting) Monday 13th June 2005

packaging suppliers who often came to *OpCo* to help with the packaging design.[21] Packaging was a critical part of both the radical projects observed at *OpCo*. For these projects members of the technology department had to develop new packaging solutions which they did together with packaging suppliers. During radical projects these specialists would build and test new packaging samples in the technology laboratory and would often have to search for and when necessary apply for patents. These packaging samples were also used when the technology specialists communicated with the functional managers.

Another activity that took place during the product feasibility stage was an examination of production feasibility.[22] This activity was organised by the functional managers and involved consultations between members of the operations and technology departments. Discussions concerning production feasibility for different projects took place in the technology laboratory. Matters discussed included critical product features and manufacturing equipment.

A total of 13 projects went through this stage of the product development process at *OpCo*. These projects came from the initial list of 40 projects put together in the idea generation stage. These 13 projects then all went through a project review gate.

Gate 3 - Project Review

At the completion of the product feasibility stage the functional managers prepared a project presentation for the executive managers to obtain approval for proceeding to the design and testing stage of the product development process. At this gate the executive managers voted on one of three courses of action regarding each

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[21] Field note (project meeting) Monday 16th May 2005
[22] Field note (project meeting) Friday 24th June 2005

project: (1) approve the project to move to the design and testing stage, (2) cancel the project permanently, or (3) ask the functional managers to continue working on the project and present the project proposal again. Those projects that were successful at this stage would proceed onto the design and testing stage where the final product and manufacturing process was developed (stage 4). Below we present two examples of the project reviews observed at executive meetings; a project review for an incremental project and a product review for a radical project.

We observed an incremental product review which was given by functional managers to executive managers in the boardroom at *OpCo*.[23] Also in attendance were all the functional managers who had been involved in the project during the product feasibility stage. The presenter started with an overview of the market segment and the need for this type of product. She then presented product cost details, which included the ingredient and packaging costs. Next she presented the other financial numbers which included contribution before marketing, contribution after marketing, cost of goods sold, and product discounts for retailers. A discussion about the project followed.

> Executive Manager A: "If we do not have this new flavour we need to continue the status quo - we started the discount programme during the year at [X%]. Do we really want to cut it back to [Y%]?"
> Executive Manager B: "That would affect contribution before marketing. But will the new flavour increase sales?"
> Executive Manager A: "To get sales we need discounts. A lot of sales are on promo."
> Executive Manager B: "Why has the total cost gone down with the increase in [this] cost?"
> Functional Manager: "We have been able to decrease costs in other areas."
> Executive Manager A: "Just put in the extra costs and see if our contribution before marketing would increase if we decreased discounts to [Y%]."

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[23] Field note (executive meeting) Tuesday 13th June 2005

> Functional Manager: "It will cost [Z] million if we increase the discounts to [X]%."
>
> Executive Manager A: "There is no cap on that discount?"
>
> Manager B: "This was not budgeted but it was needed to keep sales revenue at the current level."
>
> Executive Manager A: "How do we find the optimum level of discounting?"
>
> Executive Manager B: "You look at the marginal revenue gain."
>
> Executive Manager A: "How much do we need to spend? And what is the strategy?"
>
> Executive Manager B: "There is going to be a big difference between budget and forecast."

About a month later a radical project review was carried out at *OpCo*.[24] Before the meeting a project proposal had been circulated to the executive managers. The project review took place in the *OpCo* boardroom. There were three functional managers had been responsible for writing up the project proposal. The functional managers started with a PowerPoint presentation. The first presenter introduced the other managers who had been involved in the project so far. The presenters then said they would "bring in some samples later for you all to try." The first few PowerPoint slides reviewed the background of the project and what funding was needed to develop and launch the product. After this brief introduction the presenter talked about the project's objective as well as some details about the product and packaging issues.

Another functional manager then gave an overview of the consumer proposition. This included a brand pyramid document that the functional managers had developed for the product.[25] The functional manager talked about the intended product, the market niche at which the product was aimed, as well as the product message. The manager also presented some consumer research which had been

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[24] Field note (executive meeting) Monday 25th July 2005
[25] These brand pyramids were linked to the firm's strategy pyramid

carried out. This included both qualitative interviews and a more quantitative broad-based survey of consumers in the target market.

Another functional manager then presented the brand pyramid. At the top of the brand pyramid was *OpCo's* vision for the brand. The second layer of the pyramid contained the objectives that executive managers had set for the brand. The next layer was the strategy which briefly outlined what *OpCo* needed to do to reach the brand vision, and objectives. The strategy was also directly linked to the consumer message keeping the focus on what consumers wanted. Level 4 was the target market for the brand which included the target demographic. The 5th and final level was the consumer message which was focused on the brand image.

A functional manager then presented the business plan. This focused on the operational advantages that retailers would get from the product. At this stage the presenters sat down to take a break while product samples were brought in for the group to try.

After they had sampled the product the functional managers returned to the presentation. One of the functional managers presented a distribution chart as well as a document which outlined how to build customer awareness. Next the managers presented a document that summarised the capital expenditure that had been spent and the amount needed to launch the product. This included the advertising that would be needed to launch the product. [26]

Executive Manager A: "This is a go to [design and testing], so we will need to be in full development phase by next month."
Functional Manager A: "Today we want to signal what resources we need - both in terms of money and people."
Executive Manager B: "We need to get people with local knowledge."
Functional Manager B: "Financial assumptions are[X]."

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[26] Field note (executive meeting) Monday 25th July 2005

Functional Manager A: "You only get an [X]% margin at the moment which is very low. We need to get at least [Y]%. We are trying to get [Z]% on all our new projects. Can we ask [retailer] to take a lower margin? If we can't I will not be able to give you all the money you need."

Functional Manager B: "This is only a best guess. It could be much higher or a lot lower. Until we go to customers we will not know."

The session concluded with all the executive managers summarising their points for view.

Executive Manager A: "Good commercial and technical plan. The biggest issue though is the margin."

Executive Manager B: "We really need to work hard to get the cost of the packaging down."

Executive Manager C: "This is a classical product development case. This project is hampered by the technical aspects at a price point. This project has pushed us into a new category. It is the learning that has been the most valuable part of the project."

Executive Manager D: "This project has come a long way but we still need to understand the costs better."

Executive Manager E: "We really need to get to [Y]% margin as we will not put a lot of resources into this project at that margin."

At the conclusion of this gate a total of nine projects were approved to proceed to the design and testing stage; one radical, two semi-radical and six incremental products.

Stage-Gate 3 - Discussion

During the third stage and gate the functional managers and specialists focused on developing a detailed product concept, product formulations packaging samples and a production feasibility plan. These were then presented to the executive managers to get sign off to design and test the product.

At the feasibility stage the functional managers were concerned with reducing uncertainty around product and manufacturing issues such as - How much can we make the product for? And how much will it cost to manufacture? The functional

managers also had to take into consideration the patent situation for some of the radical products.

During the executive meetings concerned with incremental projects executive managers focused on financial projections such as contribution after marketing and cost of goods sold as well as non-financial projections such as market share and the percentage of sales sold on discount. For semi-radical projects the executive managers focused on whether or not some new technology was necessary for the firm to reach its short-term goals. For radical projects the executive managers used voting sheets[27] to help them better understand if project risk was higher than the financial reward. Executive managers completed these voting sheets after each radical project review (stage 3) meeting. These voting sheets included key indicators of financial return and a list of project risks.

Thus, the role of management control during this stage-gate was first about reducing uncertainty about product and manufacturing issues and then about how the projects would help the firm meet its strategic and financial goals.

Stage 4 - Design and Testing

During this stage project teams were formed to design and test the new product concepts. These teams comprised functional managers and specialists; the teams held weekly meetings, run by a project leader.[28] The first meeting started with a discussion about the project review by the functional managers on the team (Gate 3). An example of one of these meetings is given below.[29]

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[27] Field note (executive meeting) Monday 25th July 2005
[28] It should be noted that this section does not report directly on the project team meetings. Instead the focus is on the hierarchal interactions that took place during the stage.
[29] Field note (project meeting) Friday 5th August 2005

Functional Manager A: "We have redone the financial model – [name] and the finance guys are going through the costings again at different volume levels."

Functional Manager B: "There are 3 possible [packaging] solutions."

Functional Manager A: "I will write up the parameters and send this in writing to technology."

Functional Manager B: "We are wheel spinning at the moment and need traction."

Functional Manager C: "We need to get going on [X] and [Y] testing."

Executive Manager: "We are modelling our product on only one very powerful [Y] which may not be representative of the market."

Functional Manager B: "A rotating [Y] could even work better. If we supply [X] we need to check this out and get one that works."

Functional Manager C: "We need to get more resources onto the project and bring it together a lot faster. We need to get technical services and others involved."

Functional Manager A: "I just had a meeting with [name] about packaging and there is heaps to do. We also have the margin issues."

Executive Manager: "We need to have something to show in the short term."

Functional Manager A: "If we can get packaging sorted out then we will know where we are going. I want to make sure we have not gone too narrow to fast."

Executive Manager: "You are right. We have spent more time on that option and we do need to keep other options open."

Functional Manager A: "The main concern is [functional manager] having the time."

Functional Manager C: "He has the time but he needs to delegate."

Executive Manager: "The exec thinks we have all but cracked the packaging solution which is not quite true. While we are able to do it on one [Y] that does not mean that if will work on all [Ys] as we have not done any testing on them."

As was usual practice at *OpCo* the executive managers gave the product launch date to the project team when a project was approved.[30] The project team then worked backwards from the expected launch date to figure out how they could meet the date. If time pressures were high the project team had to decide what could be dropped from the critical path without increasing the risk of the project to an unacceptable level. For example all projects did not need the same number of production trials. If these could be cut, the product could move from design and testing to launch in a shorter period of time. This would only be done if there was enough knowledge of the

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[30] Field note (project meeting) Friday 28th January 2005

expected outcomes to mitigate the potential risk, although even that was sometimes not enough and on some occasions problems came up during first production. The decision to skip an activity or task was signalled to the executive managers who were responsible for making the final decision about what activities and tasks could be cut from the product development process.

The major activities at this stage included product formulations, packaging, costing, promotion artwork, and production plan and trials. Weekly project meetings were then held so that the project team could review the achievements and examine issues from the previous week. Progress was then mapped against the project's critical path to see if there needed to be any changes. A list of tasks was then presented along with a list of who was responsible for each task.

Gate 4 - Launch Proposal

When the project team thought that the new product was robust they sought permission to do a launch proposal to the executive and functional managers. While preparing the launch proposal project team members would meet with functional manages to talk about the proposal. The launch proposal document included the project name, a description of the project, background and rationale to launch, target market and expected launch date. This document also had some financial numbers such as the recommended selling price, forecast volumes, a three year cashflow and estimated project lifecycle.[31]

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[31] Field note (executive meeting) Monday 29th August 2005

At this gate the executive managers focused on how the new product helped the firm achieve its financial and strategic goals. According to the executive managers at one of these meetings;[32]

> Executive Manager A: "We usually only look at one side of the equation - we really need to concentrate on products that make money"
> Executive Manager B: "We need to change our thinking and only launch products under our [X] brands that will make money"

Stage-Gate 4 - Discussion

During the fourth stage-gate the functional managers and specialists decided the product formulations, packaging, costing, promotion artwork, and put together a production plan with trials. When this had all been finalised a launch plan was presented to the executive managers.

As in stages 2 and 3 these was still considerable attention paid to the questions: how much can we sell the product for? And how much will it cost to manufacture? But now there was also another uncertainty - Where can I buy supplies of raw material? When organisation members interacted during these activities they were focused on reducing technical and marketing uncertainty associated with product formulation options, packaging design options and product costings. For incremental projects the functional specialists collected and analysed information in the form of ingredient and packaging cost lists, project updates and project samples. For semi-radical projects members collected and analysed marketing and manufacturing information. During radical projects organisation members would gather information on technology, costs and markets to reduce uncertainty.

During the launch proposal presentations that the researcher observed, organisation members used market share, contribution after marketing, profit and

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[32] Field note (executive meeting) Monday 29th August 2005

market research information to promote goal congruence. One major difference between the executive and functional managers during these presentations lay in the performance measures that they were aiming to achieve. While the functional managers were evaluated on market share which was a strategic goal of the company, the executive managers were evaluated on profit (EBIT to be exact), which was a financial goal. This often led to disagreements during these meeting as some projects that the functional managers needed to increase market share were not very profitable for the firm.

Stage 5 - Launch

The marketing and technology functional specialists were responsible for new products all the way to the end of the first production run.[33] After the production and shipment of new products these functional specialists would follow up on issues related to the product but these activities were outside the scope of this study.

After the executive managers approved the launch proposal the functional specialists had to organise the first production run for the new product.[34] To do this they worked closely with operations. Usually a functional specialist was present in the factory during the first production run to make sure that there were no problems. If a problem did occur they consulted with functional managers to see what they should do. During first production runs the results were communicated to functional managers through post-production documents.

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[33] Field note (executive meeting) Monday 29th August 2005
[34] *OpCo* PMO Document September 2004

Stage 5 - Discussion

At the launch stage we observed functional specialists discussing production issues such as - How to manufacture the product to get the best results? And how large should the first production run be? They used operational numbers such as line speed, temperature, machine settings, production plans and trial reports mainly about technical issues.

Conclusion

This paper has shown that in a product development setting both the goal-congruence and uncertainty reduction roles of management control are important. With a view to understanding the roles of management control, we observed how organisation members enacted management control in practice, including the three elements of management control within our case organisation – input control, process control and output control (see Table 4).

Insert Table 4 Here

Input control was accomplished in our case study firm through monitoring of the resources being used. This focused on the time and resources that members from the three hierarchal communities at *OpCo* spent on product development activities. Process control was accomplished through activities carried out by organisation members at the stages and gates of the product development process. These included the generation of new ideas, idea screening, project briefs, project screening, feasibility, design and testing, launch proposal and launch. Finally output control was accomplished when key indicators were monitored and information evaluated. We

also report the outputs (number of approved projects) which passed through each product development stage and gate.

Our observations of product development indicate that management control was enacted to reduce uncertainty, mainly during the stages, and to promote goal congruence, mainly during the gates or decision points. This supports Davila's finding that project managers (equivalent to functional managers in the current study) concentrate on activities related to reducing uncertainty during product design (stage 4). However, our observations show that activities related to uncertainty reduction were prevalent during all stages. Further, there was a strong goal congruence focus during activities that took place at the gates. We found that input control – related to the presence of members of each of the three hierarchal communities (executive managers, functional managers and functional specialists) during activities seemed to have a strong influence on the role of management control during product development as each focused on different organisational issues.

We observed at executive meetings that executive managers took part in activities that focused on setting and monitoring the firm's strategic and financial goals. These managers were concerned with how the product would help the firm meet its strategy as well as the financial return a new product would make to the firm. At these meetings executive managers focused on project performance indicators such as contribution before and after marketing, earnings before interest and tax and strategic indicators such as market share. This led executive managers to focus on resources[35] allocated to different projects in an attempt to maximise the return for the firm. Thus, these managers focused on activities related to promoting goal congruence.

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[35] Resources in this context relate to the time that functional managers and specialists could spend on projects

Functional specialists were mainly involved in the activities that took place during the stages of the product development process. The functional specialists were concerned during product development with carrying out product development activities and gathering information on the market and technology. In order to reduce uncertainty they collected and evaluated information on competitors, customers, ingredients, product formulations, packaging, artwork, costing and the production processes.

The functional managers were in the middle. They thus took part in gate activities focused on reporting project progress to the executive managers but were also involved in activities with functional specialists during the stages. For this reason the functional managers had to have a different management control focus when dealing with each group. When they were involved in activities with functional specialists during the stages their main focus seemed to be on understanding how the activities they were taking part in and the information they were gathering could be used to reduce technical or market uncertainty. The functional managers were also involved in activities during the gates of the product development process as they presented project reviews to the executive managers. During these activities with executive managers at the gates they had to change their focus to the strategic and financial goals of the firm. Thus, during the stages the functional managers were mainly focused on reducing uncertainty through their interactions with members of the functional specialists while at the gates of the product development process they were mainly focused on goal congruence issues as they interacted with executive manager. The functional managers played a key role in linking the promotion of goal congruence activities led by the executive managers with the uncertainty reduction

activities of the functional specialists during the product development process creating a balance between the two.

We did not find any evidence that the type of product development project (incremental or radical) had a substantial effect on the role of management control enacted. While we would have expected that radical projects would have a stronger uncertainty reduction focus than incremental projects (see for example Davila *et al.*, 2006; Rice *et al.*, 1998) this is not evident from the findings. Even during the early gate meetings held for radical projects the executive managers were most interested in how these projects would help the firm reach its strategic and financial goals. The radical projects were protected from this to some extent as they did not go through stage 2 and gate 2 (see Table 4).

Limitations and future research

A limitation of this study was the difficulty in observing all the interactions that took place throughout the organisation. Although it was possible to attend most meetings that were held regularly and planned in advance, it was more difficult to attend meetings that took place on short notice. This may have affected the case findings.

Future research in this area could look at other types of control such as budgets or could even take a departmental view by examining the roles of management control within a function (such as technology or marketing) as this is where a lot of interactions took place during product development.

In conclusion, this paper has shed light on the two roles of management control as enacted through inputs, processes and outputs at different times during product development. It has shown that the role of management control changes

during product development as interactions between functional managers and specialists focus on reducing uncertainty during the activities taking place during the stages while interactions between executive and functional managers focus on promoting goal congruence during the activities taking place at the gates.

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Table 1: Field Notes

Field Notes	Number
Project selection/Portfolio meetings	10
Project meetings	150
Functional manager meetings	20
Executive meetings	25
Office conversations	270

Table 2: Communities of Practice Observed at *OpCo*

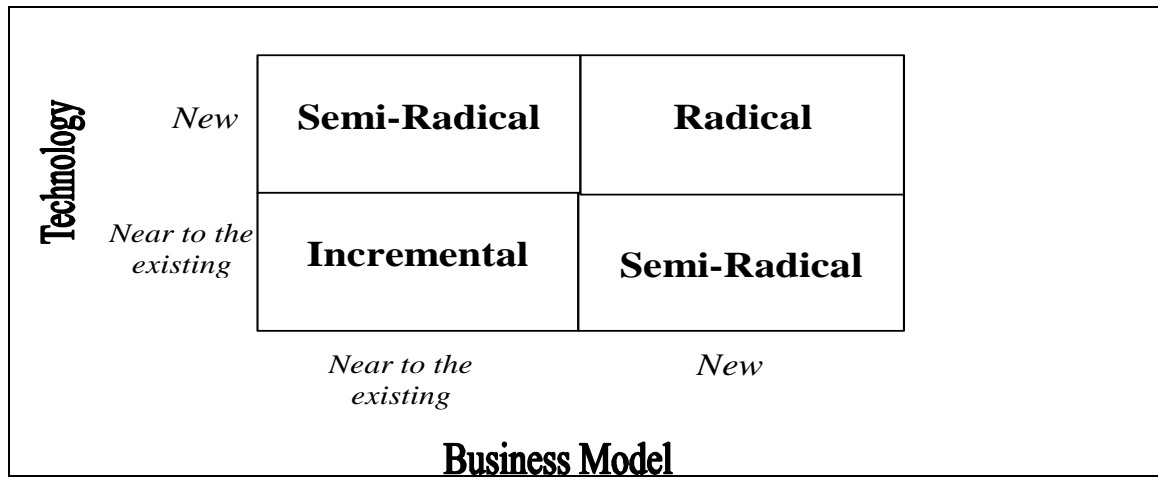| *Executive Manager Community*	CEO	GM Technology	GM Marketing	GM Sales	CFO	GM Operations	GM HR
Functional Manager Community	Business process manager (1)	Technology managers (2)	Marketing managers (2)	Sales managers (2)	Finance managers (2)	Operations managers (1)	HR managers (1)
Functional Specialist Community		Technology specialists (4)	Marketing specialists (4)	Sales specialists (3)		Operations specialists (2)	

Table 3: Eight Projects Observed at *OpCo*

Project Name	Project Type	Development Time	Outcome
Project ST	Radical	9 months	Launched
Project CA	Radical	5 months	Cut – Gate 3
Project RB	Semi-radical	5 months	Launched
Project SD	Semi-radical	3 months	Cut – Gate 3
Project BN	Incremental	4 months	Launched
Project TO	Incremental	9 months	Launched
Project TP	Incremental	3 months	Launched
Project BL	Incremental	3 months	Launched

Table 4 - Summary of Findings: The Roles of Management Control at *OpCo*

Process	Input Control Accomplished through monitoring of the resources being used	Process Control Accomplished through activities carried out by organisation members	Output Control Accomplished when key indicators were monitored and information evaluated	Outputs Number of Projects	Role of Management Control Goal congruence and uncertainty reduction at *OpCo*
Stage 1 Ideation	Monitored the time and resources that members from the three communities of practice spent on generating new ideas	Idea list Brain-storming Ideation Presentations Laboratory activities	Information collected and evaluated: Ideas created and then evaluated subjectively by members from all three communities of practice	40 Projects Radical - 5 Semi-radical -15 Incremental - 20	***Uncertainty reduction focus*** Enacted by getting all communities involved in creating and evaluating new ideas The firm addressed the following questions to reduce uncertainty: *Who will buy this product?* *What are our competitors doing?*
Gate 1 Screening	Monitored the involvement of the members from the two management communities	Idea screen meetings	Key indicators: Revenue/market share potential, cost and complexity, wow factor, brand alignment, time to market	15 Projects Radical - 4 Semi-radical -3 Incremental – 8	***Goal congruence focus*** Enacted through the two management communities ranking projects using the dimensions which linked their goals to the goals of the organisation
Stage 2 Planning	Monitored the time the two functional communities spent on project planning	Writing up project briefs	Information collected and evaluated: Consumer insights, consumer needs, market dynamics, project deliverables, brand requirements, product concept, estimated sales, financial and manufacturing issues	11 Projects Radical - 0 Semi-radical -3 Incremental – 8	***Uncertainty reduction focus*** Enacted through the two functional communities collecting and analysing market and technical information The firm addressed the following questions to reduce uncertainty: *How much can we sell the product for?* *How much will it cost to manufacture?*
Gate 2 Screening	Monitored the involvement of the members from the two management communities	Project screen meetings	Key indicators were: Financials - gross margin, project revenue, profitability Non-financial - market share gain	11 Projects Radical - 0 Semi-radical -3 Incremental – 8	***Goal congruence focus*** Enacted through the two management communities focusing on key financials showing how the project added value to the firm
Stage 3 Feasibility	Monitored the time and resources that members from the two functional communities spent on project feasibility	Project concept Product formulation Package design Production feasibility	Information collected and evaluated: product concept briefs, product formulation tests, packaging samples and production feasibility	13 Projects Radical - 2 Semi-radical -3 Incremental – 8	***Uncertainty reduction focus*** Enacted through the two functional communities collecting, testing and analysing information The firm addressed the following questions to reduce uncertainty: *How much can we make the product for?* *How much will it cost to manufacture?*
Gate 3 Review	Monitored the involvement of the members from the two management communities	Project review meetings	Key indicators were: financials, links to strategy pyramid, voting sheet which showed the risks verses the potential rewards	9 Projects Radical - 1 Semi-radical -2 Incremental – 6	***Goal congruence focus*** Enacted through the two management communities focusing on key financials and the strategy pyramid: Incremental projects - focus on financial projections Semi-radical projects -focus on new technology or business models Radical projects – focus on risk versus financial reward
Stage 4 Development	Monitored the time and resources that members from the two functional communities spent on project development	Design activities Testing activities	Information collected and evaluated: Tests of product design, packaging design and production capabilities	9 Projects Radical - 1 Semi-radical -2 Incremental - 6	***Uncertainty reduction focus*** Enacted through the two functional communities carrying out design and testing activities The firm addressed the following questions to reduce uncertainty: *How much can we sell the product for?* *How much will it cost to manufacture?* *Where can I buy supplies of raw material?*
Gate 4 Proposal	Monitored the involvement of the members from the two management communities	Launch proposal meeting	Key indicators were: rationale to launch, target market and expected launch date with financial numbers - recommended selling price and forecast volumes	6 Projects Radical - 1 Semi-radical -1 Incremental - 4	***Goal congruence focus*** Enacted through the two management communities focusing on market share, contribution after marketing, profit and market research information
Stage 5 Launch	Monitored the time and resources that members from the two functional communities spent on product launch	First production run Launch of product	Information collected and evaluated: production plan and market launch	6 Projects Radical - 1 Semi-radical -1 Incremental - 4	***Uncertainty reduction focus*** Enacted through the two functional communities with a focus on the link between product development and operations The firm addressed the following questions to reduce uncertainty: *How to manufacture the product to get the best results?* *How large should the first production run be?*

Figure 1: Framework of Product Development Project Types

	Near to the existing	New
New	Semi-Radical	Radical
Near to the existing	Incremental	Semi-Radical

Technology (vertical axis)

Business Model (horizontal axis)

Source: Davila *et al*. (2006, p. 39)

Figure 2: Organisation Structure of *OpCo*

Figure 3: Standard NPD Process

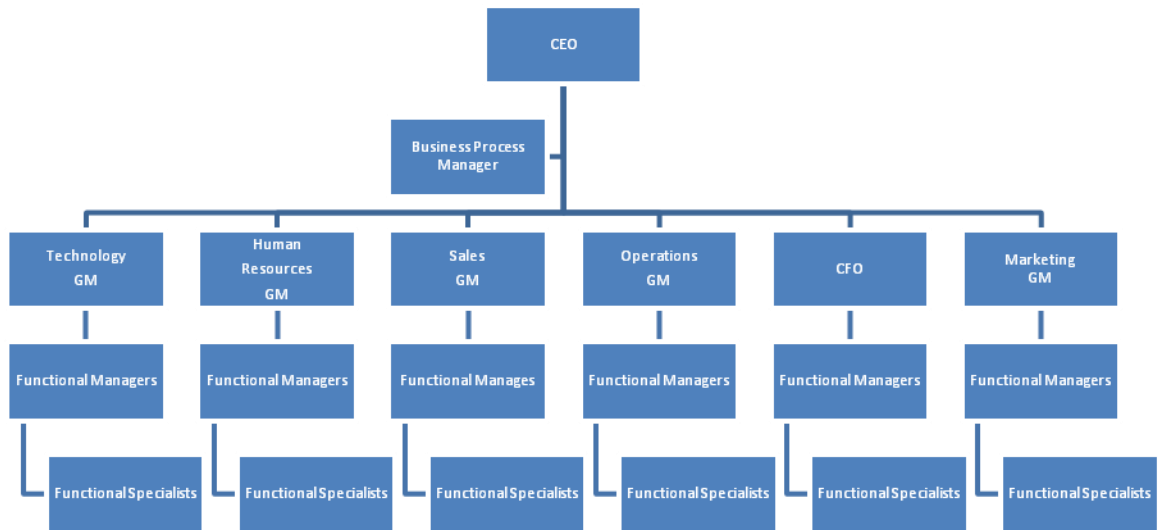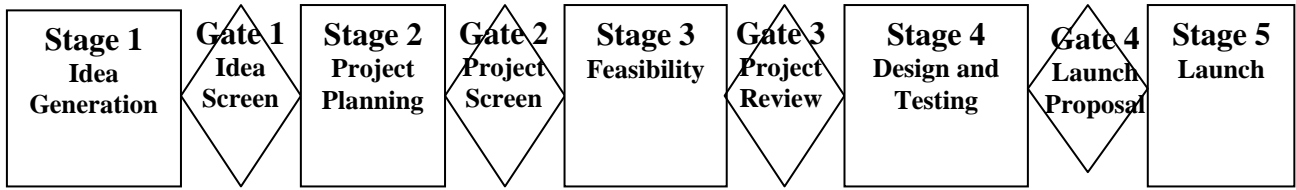| Stage 1 Idea Generation | Gate 1 Idea Screen | Stage 2 Project Planning | Gate 2 Project Screen | Stage 3 Feasibility | Gate 3 Project Review | Stage 4 Design and Testing | Gate 4 Launch Proposal | Stage 5 Launch |

About the authors

Chris Akroyd lectures management accounting at the University of Auckland, New Zealand. He has a PhD from The University of Auckland and Masters degrees from The University of New South Wales (Australia) and Kobe University (Japan). He is a member of CPA Australia. His research interests centre on the use of management control in product development. Chris is the corresponding author and can be contacted at: c.akroyd@auckland.ac.nz

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