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EXECUTING MANAGEMENT CONTROL THROUGH DECISION TECHNOLOGY

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Abstract

When competition is tough and resources are scarce, management may seek ways to systematise their decision-making process so as to control their operations and resource allocations. Yet little is known about how decision technology is used as a means to administer managerial control. This research investigates how an organisation used decision technology to execute management control to manage the work activities of their employees in a group decision-making setting. It assesses the impact decision technology has had at the firm level focusing on the transformation of the formalised decision process and the individuals involved. The research is carried out using case study, where the data is collected from multiple sources including passive observations in board meetings and functional team meetings, and interviews with decision makers of different hierarchal levels. We found that the decision technology not only enabled management to execute management control vertically across different hierarchal levels but also horizontally over their fellow peers. We also learned that product development decisions that were previously avoided (due to fear of project failure) are now made. This is noted from the increased number of radical (for the firm) new products commercially launched.

Keywords: adoption, case study, diffusion, information technology impacts, management control.

1 INTRODUCTION

Research has shown that management executes controls during product development (Davila, 2000; Bisbe and Otley, 2004) and that technology adoption and diffusion impacts organisations (Fichman, 1992). Technology is increasingly being used to assist in executing managerial activities and decision making within organisations (Chapman, 2005) and yet we know very little about the use of decision technology by management (Dechow and Mouritsen, 2005; Quattrone and Hopper, 2005) and the impact the adoption and diffusion of these tools has on management control.

In this paper, we examine how an organisation used a decision technology and how the use of the decision technology changed the way in which management control was accomplished. Our focus in this paper is on analysing the impact and consequences of organisational change on management control as a result of technology adoption and diffusion in practice in a group decision-making context. Two research questions were used to guide this study: (1) How did the use of a decision technology influence formalisation in the decision process? and (2) How did the use of a decision technology influence individuals involved during the decision process?

We use a case study approach (Dube and Pare 2003, Yin 2003) to capture a rich set of data that comes with an intensive single case study. The case study is an approach suitable for learning about the implementation of decision technologies in practice at the firm level (O'Leary, 2008), developing and generating new theory and knowledge (Cooper and Morgan, 2008), demonstrating situated experience (Mackrell, Kerr and von Hellens, 2009) and the application of decision technology in practice (Arnott and Pervan, 2005). As a research methodology it helps us learn about the real issues and problems faced by organisations.

From the intensive case study conducted, we found that the decision technology changed the way in which management control was perceived in the organisation. Before the implementation of the decision technology managers were focused on the outcomes of product development projects. With the introduction of the decision technology controls changed with the new focus on the actions of managers during product development. This gave management a new-found confidence which they were previously lacking. This new technology made it possible for managers to be convinced that their subordinates could deliver new radical products to the firm. Prior to the implementation of the decision technology, managers had been conservative in their decisions which resulted in them considering only incremental new products as they were reluctant to approve projects that might fail. We argue that this change in behaviour occurred because the managers were no longer accountable for the success or failure of product development projects, but rather became accountable for fulfilling their responsibilities during the product development process.

This paper extends existing the literature on the use of management control within the new product development context (Davila, 2000; Bisbe and Otley, 2004; Davila, Foster and Li, 2009; Jørgensen and Messner, 2009; 2009) and the use of technology as an electronic colleague that participates and redistributes the burden of accountability (Arnold and Sutton, 1998) as an enabling approach to management control (Chapman and Kihn, 2009). It contributes empirical evidence to the knowledge of technology adoption and diffusion which is an increasingly important for organisations in executing management controls, managing their decision process and managing individuals involved in the process (Fichman, 1992).

The decision technology on which this research paper is focused on is a commercial technology called Accolade. This decision technology is used by many firms in managing their new product development process and communicating progress and outcomes throughout the decision process. The case site selected was a commercial firm that undertook a number of new product development projects and employed this particular decision technology to assist them when making new product development decisions. The methods used to collect the case study data included direct observations of management board meetings and functional team meetings as well as interviews and document analysis.

Our findings show that before the introduction of the decision technology, most individuals were not prepared to take responsibility for the product development process or making decisions concerning new products, and so avoided starting new projects. Because of the perceived risk of product develop management did not believe their employees were capable of handling innovative projects. After the implementation of the decision technology we found that not only were decisions being made but more innovative projects were also being considered, approved, developed and commercially launched. We also found that through the decision technology, management was not only able to administer management controls on their employees but also among their fellow peers.

In the remainder of this paper a more detailed account of the decision making process during product development is given. This is followed by an overview of the research domain and the research design and methods applied in this study. A comprehensive account of how the decision technology influenced control is subsequently described in the case study section. An analysis of the case study findings is then presented in the discussion section. This is then followed by a conclusion which summarises the findings and presents some limitations of the study as well as some future areas of research.

2 THE USE OF TECHNOLOGY IN PRODUCT DEVELOPMENT

Increasingly, information technologies are being used to collect, disseminate and monitor managerial activities and assist decision making within an organisation (Chapman, 2005). Decision technology defines the logic by which decision management and decision control are performed. They are frequently adopted to assist decision makers with their innovation decisions so that they can become better informed of potential issues or solutions involved. Therefore, decision technology can be considered as channels through which management can execute their control (Dechow and Mouritsen, 2005).

A number of decisions are usually made before new products can be brought to market. These decisions cover a spectrum of operational and strategic decisions. Decisions about how a product can be designed, produced, and packaged not only influences production costs, but are particularly critical to the commercial success and failure of products and profitability of firms. Hence, management accounting information needs to be captured so that product design, product costing, and product pricing decisions can be made as part of the decision-making process in new product development. Each decision can involve a multitude of considerations such as strategic fit, competitiveness, synergies, technical configuration and feasibility, procurement and distribution, financial risk and reward. Besides deciding on whether to launch a new product or not, managers also need to decide on which projects are prioritised. This is because firms do not have the resources to launch all probable new products at the same time. Managers also need to determine the product mix of all existing and new products. This calls for a good product mix strategy which complements the strategy to introduce new products. Due to the nature of commercialising new products much of management control is driven by uncertainty and product strategy (Davila, 2000). With the increasing use of technology, the research challenge lies in discovering how control is "establishing order into work activities" with the aid of technology (Quattrone and Hopper, 2005).

Given all the factors that need to be considered, product development decisions are often made by a group of individuals who hold different knowledge and expertise across the firm. It is also a topic that is regarded as relatively complex given the creative demands of product designers and the high uncertainty of their outcomes (Jørgensen and Messner, 2009). One of the factors that can be leveraged to improve an organisation's new product performance is the effective use of a new product development decision process (Anderson, 2008). Furthermore, the failure of new products has been linked to the weaknesses of this decision making process (Cooper and Kleinschmidt, 1996; Stewart-Knox and Michell, 2003).

It has been suggested that the new product development decision making process could be enhanced through process automation (Cooper and Edgett, 2008). This allows administering the completion of

process activities and regulating the process deliverable routines in a coordinated and organised manner (Cooper, 2008). Therefore, decision technology could be employed to automate and enhance the decision process so that individuals involved can focus their energy on making the important product development decisions. Despite their potential benefit, little is known about the use of decision technology in new product development practices (Sarin, 2009).

On many occasions, management engages, manages and intervenes in product innovation projects through meetings (Christiansen and Varnes, 2007). A decision technology may create opportunities for equal participation in these meetings. Individuals may no longer need to conform to an opinion confirmed by the majority (von Winterfeldt and Edwards, 1986). They may not need to agree to the first solution raised to avoid offending anyone even if the solution is not the optimum one (Rowe, 1992). Furthermore, the use of a decision technology may reduce the likelihood for certain individuals dominating the decision dialogue because of their status or personality rather than their knowledge (Morgan and Henrion, 1990). The use of a decision technology may also assist with group dynamics by stopping collective decisions being over-influenced by more talkative individuals in meetings even when these individuals may not be the best informed individuals (Rowe, 1992).

The introduction and implementation of a decision technology often brings a sense of uncertainty relating to the replacement of human judgments and individuals in the decision process. There are three possible extremes in the theory of technology dominance (Arnold and Sutton, 1998): (1) individuals are in a contempt relationship with the technology if they do not have sufficient experience of the matter and/or regards for the system; (2) individuals are in a collaborative relationship with the technology if they consider the technology as a fellow decision team member that contributes and proposes ideas; and (3) technology has essentially eliminated the need for skilled labourers or human judgments. Therefore, it would be of interest to find out how the people involved in the new product development decision process are affected, if any, from the use of decision technology. Furthermore, if this effect on people applies across the organisation, or specifically on some people depending on whether they execute and/or receive management control through the use of decision technology.

3 RESEARCH DOMAIN

In this paper we report on a case study of a firm which operated in the food industry. In terms of developing new products, the food industry was seen as having a number of unique features in comparison to other industries. They experience small windows of opportunity to launch their new products to match current trends in already saturated markets. This made the development of new products a challenging undertaking in this context. Even when businesses have the technology, expertise and capacity to develop radical new products, there were restrictions on the willingness of retailers' to stock them. Furthermore, many consumer food products experience short lifecycles and thus disappear from the shelves within one year of their introduction. Given all these constraints many food businesses prefer to redevelop existing products to reduce their failure rates and hence incremental new products are traditionally introduced rather than radical new products. However, this approach puts businesses into a vicious cycle to maintain financial performance as they fight in an already intense and saturated market with new products that have shorter lifecycles. Businesses needed to have a good new product development process so that they can make decisions in an efficient manner. Therefore, decision technology can be employed to help better manage new product development decisions.

In this research paper, we focused on a commercial decision technology called *Accolade* that is used by many firms developing new products in the Asia-Pacific, North America and European regions. This decision technology was developed by an international consulting firm called *Sopheon*. *Accolade* enables project management as well as follows and automates a decision process known as the Stage-Gate® Product Innovation process. The Stage-Gate® Product Innovation process is a well adopted (Griffin, 1997) and researched decision process in new product development (Cooper, 2008; Summers

and Scherpereel, 2008). It operates as a conceptual roadmap in moving each new product decision problem through the decision process from idea inception at the start through to product launch in the end. It also helps support those individuals involved in a firm's new product development to better manage each project concept through the decision process in a complete and orderly fashion. Such notions may assist in achieving an enhanced decision outcome when incorporated within a decision technology, but the decision technology neither makes decisions nor generates new product ideas.

The decision technology, *Accolade*, acts as a central repository where all applicable information can be entered into and retrieved from one single source in a consistent fashion. A variety of data is collected in the process. Besides collecting financial data to quantify the probable financial returns, non-financial data about the strategic fit, market attractiveness, technical feasibility, and ease of implementation, and management accounting data such as budget, forecast, and performance are also collected to assist businesses in the new product development process. It also keeps track of when the action dates are and who the individuals responsible for specific tasks are.

4 RESEARCH DESIGN AND METHODS

A case study was carried out firstly since it was more suited to understanding how a decision technology could shape an organisation's decision process. This was important in addressing the first research question in understanding how formalisation was structured through the implementation of a decision technology. Secondly, we wanted to hear and see what and how individuals perceived as a result of the technology implementation. This was valuable in addressing the second research question in learning about individuals' conscious viewpoints as well as their unconscious actions. Only when we have examined the influences on the decision process as well as on the individuals we could conclude on the execution of management controls through decision technology.

Three specific methods were employed to collect the case study data. First, non-participative observations were used to collect information at new product development decision meetings and during investigation activities. These observations provided rich data not only in examining the interactions and discussions among individuals involved but also allowed the monitoring of decisions while they were making progress. Observing the decisions in progress was more desirable than retrieving them through individuals' retrospective recollection. The second method, interviews, were used to collect data from individuals involved in new product development that represented varying organisational hierarchy levels across the firm. These interviews brought organisational wide viewpoints together and provided opportunities to compare and contrast opinions between those recipients who only saw the end results and those from those employees who used the decision technology on a daily basis. The third method involved analysing the data extracted from the organisation's new product development decision technology. This data provided the information for which decision meetings' interactions and discussions were based upon. Collectively, these three methods helped us examine an organisation's management control through the interactions and actions of those individuals involved.

By the time data collection began at the case site, the decision technology had been implemented for nearly two years. Individuals were interviewed and observed over a period of 7 months during the 2009 calendar year. During this period, 3 new projects were launched onto the market while 28 projects were presented and discussed at 6 senior management board meetings. There were 28 licensed users at the case site, of which over 40% of them in total were interviewed. These users represented various organisational hierarchal levels and included the CEO and all users directly involved in approving and leading the decision projects. One-third of the line managers were interviewed, though two-third of them was observed in board meetings and/or functional team meetings. None of the unit managers were interviewed, but two-third of them was observed in decision meetings.

5 THE CASE STUDY: DATA COLLECTION

Our case site, *Big Fish* (a pseudonym), was a food company that reared, farmed, developed and processed its own fish products in New Zealand. It employed over 400 employees across the company and on several aquaculture sites. Half of their products were sold locally in New Zealand while the other half were sold abroad, mostly to Australia, Japan and the United States. *Big Fish* developed and processed all of its new consumer food products in house. The company's definition of radical new products included products and/or processes that involved technology that were new to the company, as well as products that had never been introduced by the company. The notion to actively develop and introduce new consumer products became part of the company's strategy in 2005. This was seen as an important move by the company due to the increased competition it was facing locally in the market. Therefore, the company saw the need to launch more value added products to gain a greater profit margin. However, the sale of new value added products reached only 1% and did not surpass the revenue target for new products of 2%.

Rather than immediately investing more resources into new product development, some of the management team began holding a weekly book club to learn of a structured new product development decision process that was adopted by many other food companies. This structured process, known as the Stage-Gate® Product Innovation process, was one that was formulated through best practices. During these reading sessions, they learnt about the benefits and pitfalls from cases of other companies that had deployed such a structured process. The general managers categorised their past decision process as being "*pretty chaotic and not very well organised*". One of them even highlighted that the past process "*was very much driven by personal favourites and gut feel*". Therefore, they believed there should be a system for everything and a bit of discipline was what they needed to help improve it. They soon became convinced that a structured process could only be fully attained through the administration of a decision technology rather than relying solely on individuals to uphold the administrative progression. Consequently, *Big Fish* decided to implement *Accolade* to help manage and realise their new product development efforts in June-2007.

The generation of new project ideas was never a concern before or after the implementation of the decision technology. The concerns have always been relating to the management, evaluation and decision making of project ideas. Product development was traditionally a topic shared only between two divisions: manufacturing operations; and sales and marketing. Soon, much debate and resistance surfaced whilst a team of decision makers was being formalised among senior management members. The General Manager of Corporate Finance was delighted that he was finally "invited" to be part of this decision process, but the General Manager of Aquaculture (GMAQ) had to fight hard to be included as a member of this business decision process. Given the organisational structure of the company and how important new product development was to the business, the GMAQ felt an aquaculture voice should not be excluded from the decision process, "*So I wanted to be involved in the discussions. And I thought it would help improve our relationships within the management group team. And I think it has helped with that*".

Nevertheless, the Chief Executive Officer (CEO) was officially kept from being a member of this business decision process. The CEO maintained that he was nevertheless still in control and could exert authority. He insisted that "*it's not about exercising power, it's about doing what's right*" and argued that it was an unlikely occurrence for him to exert his authority since "*I will be at odds with the consensus there*". The CEO was adamant that his surrendering of this critical position would uplift the morale of his senior management as it made them feel responsible for this decision process.

Unlike most other companies, *Big Fish* did not trial a manual stage-gate product innovation process before implementing *Accolade*. Senior management of *Big Fish* made a conscious decision to put technology in place to drive the structured decision process and have effectively adopted both the manual and automated Stage-Gate® Product Innovation process simultaneously to manage its new product development process. Senior management of *Big Fish* insisted that a decision technology was something that the company needed in order to move forward. They did not perceive the cost of implementing the decision technology as a financial barrier. Even the CEO believed that the cost of

the decision technology was insignificant in comparison to the volume of Salmon fish produced each year.

Not only did *Big Fish* not implement a manual stage-gate process, they made a bold investment by insisting on implementing a software version with full functionality, hosting and owning the backend database at its premises through their acquisition of *Accolade*. According to a general manager, "*If we were going to do it, we should do it full*". This was despite it being an investment which was beyond the usual amount for a company their size. In the past, the responsibility for developing new products was part of sales and marketing's job. However, when it came to developing the ideas, neither of the two traditional divisions, manufacturing operations and sales and marketing, took responsibility for making decisions. Therefore, besides investing in a decision technology, *Big Fish* also hired new employees to form a product development team dedicated to manage the new product development process on a daily basis. This initiative also allowed line managers from those two divisions to be solely responsible for the daily running of their current products, rather than directly accountable for prospective projects that were not still in development. The CEO believed "*it was an investment for the longer term and not the short term, and that was ballsy. That was a courageous decision, I think it's starting to pay off and we're starting to see it now*".

The notion of a decision technology in action brought about the possibility of instigating discipline into an otherwise chaotic and unorganised decision process. With the right cultivation, such a notion could lead to an improvement in the accountability and responsibility of decision making in the firm.

"*I like the idea of, when it was sold to us, it was saying we'll record all your comments and be able to go back and say 'who said this was a crap idea and who said it was a great idea?'. And you'll be able to then get a feel for people's judgment. And people's judgment will be better informed the next time. Because there's that accountability. Because what you said back then has been recorded. And I thought that was really powerful.*"

The mere fact that all past contribution comments were captured; individuals could be held accountable for their unsubstantiated remarks. For example, sales would need to explain why their predicted sales figure varied significantly from the last round. According to one of the general managers, until now, all individuals involved "*have entered the process in good faith and have got on with it in good faith. And I think that good faith has been rewarded and we've all treated each other's points of view with respect. There's been no real problems*".

Among the 28 licensed decision technology users, 4 individuals were specifically employed to run and manage the new product development process. These employees were categorised as "product development technologists". The rest of the users either contributed during the development process as requested based on their respective expertise, i.e. "line management"; or evaluated the decisions in progress based on their management role, i.e. "senior management". Together with the new product development technical manager all four General Managers representing the entirety of the senior management of the firm formed a new product development gate keeper team. This team was set up to collectively manage and decide on the progress of product development projects. Only these 5 gate keepers have voting rights in the decision process. The gate keepers would only consult the CEO if a request for capital expenditure was required.

Even though the CEO had been excluded from the formal decision process, he did log into the decision technology and monitor the project progress as a licensed user. He also came to decision meetings unexpectedly as he wanted to show his physical presence to his fellow employees that he was supporting them, and was not ignoring them. He would express his reservations while in the decision meetings despite the fact that he had no voting rights.

There have been a number of instances where information on a project's progress and findings were not made available in the agreed timeframe. This was usually caused by the sales line manager late in his submission of predicted sales figure. However, on those occasions the pressure was immediately placed upon the General Manager of Sales and Marketing to tell his subordinate to step up his team's contribution.

Discussions held in the decision meetings were usually focused on the topics presented and rarely strayed to unrelated topics or project ideas. Some gate keepers might come to the meetings and inquire from other gate keepers about some functioning aspects of the project findings so that they could have a fuller picture. Alternatively, the technologists might provide new and updated information at the meetings and thus sparkled new questions raised from the gate keepers. Frequently, discussions arose following an earlier inquiry or on some specific information that was presented. Since the decision technology was brought into the meeting room, it could readily be used to reveal the composition of the summarised information. In occasions where indecisiveness or disoriented gaze or exchanges were made, some of the gate keepers would mention "*What would Cooper do?*" To them, Cooper was the leading author and speaker in the new product development literature and trainings which they have became familiar with. The timely reminder often brought an otherwise disparate group of individuals to focus and vote on the matter and make a decisive collective decision.

Besides the usual new products being considered as part of the decision process, customer requests were also captured and assessed accordingly in the same manner. Given that a market already existed in these scenarios, the question of should the project idea receive the go ahead encompassed also whether it should be put through a full decision process or fast tracked through a modified decision process. The same discipline in examining a potential project idea was applied here. This examination not only involved dimensions and profitability, but also entailed its alignment with company strategy.

6 ANALYSIS OF CASE STUDY FINDINGS

From the last section, we learnt that the implementation of a fully functioning commercial decision technology, *Accolade*, at *Big Fish* occurred as a result of management's belief in the use of information technology to drive the decision process. This belief was ignited from their desire to better manage and structure the new product development decision process. The use of this decision technology in the new product development decision process resulted in some noticeable and possibly unexpected changes to the management control processes. In addition to a change in the decision process itself, it brought about a change in the relationship between individuals and technology and a change in attitude towards accountability among individuals across the chain of command.

In terms of the decision process itself, the decision technology essentially provided those individuals involved in the decision process with an automated structured process to follow (Cooper, 2008). It gave them a standardized template to collect, critique, and compare information on all aspects of the proposed project idea through a set of criteria (Quattrone and Hopper, 2005) which they could use to define boundaries around their own work activities. The decision technology became their fellow decision team member coaching them in carrying out their work activities (Arnold and Sutton, 1998). It provided them with a central information repository that users from different tiers of the organization hierarchy could collate and retrieve to suit their needs of varying perspectives. It also assisted the individuals involved in resolving inquiries about project prospects through uncovering summary analysis.

Through decision meetings, we could see how management engaged, managed and intervened in product innovation projects (Christiansen and Varnes, 2007). The decision technology not only changed the way individuals interacted with the decision process, but it increased the transparency in their internal communication and altered the way individuals conversed in decision meetings and throughout the decision process. The decision technology operated as a silent colleague ensuring every decision member had an equal chance of participation in the decision process. Even if an individual had an introvert personality, their reservations and/or views were recorded and publicised through the decision technology. This played an important part in ensuring objectivity can be preserved throughout the decision process. Furthermore, the decision technology had focused their meeting dialogues and discussion points, and ensured those conversations did not get sidetrack. Hence, decisions were made.

Considering that the decision technology kept details of individuals' remarks, one would expect individuals involved in the decision process to become cautious and conservative in disseminating their own remarks and critical in attributing the remarks made by other individuals. This was not the situation at *Big Fish*. During the decision meetings, individuals became more willing to voice their concerns rather than conforming to views confirmed by the majority (von Winterfeldt and Edwards, 1986). They were also seen willing to seek verification from their fellow peers who might be more knowledgeable in certain areas. It became apparent that the decision technology had not only provided those involved in the decision process with appropriate information but also forced them to make decisions more objectively rather than intuitively, and discouraged avoidance and/or deferment of decisions in decision meetings.

After the implementation of the decision technology, all probable projects had to be documented in the decision technology and scheduled for discussions in decision meetings. It might appear tedious when each probable project had to follow the decision process protocols, regardless of the size, scope or urgency of the project. However, each probably project received the same degree of treatment and scrutiny in the decision process. Staff also learned very quickly that each idea submitted and captured would be explored by the product development technologists. Hence, none of them would endure the embarrassment for suggesting an undeveloped idea, or bear the sole responsibility for any project failure by following this protocol.

The uniformity of the information collated and presented allowed individuals to compare and evaluate project prospects proficiently without wasting unnecessary time. Individuals were able to locate and review project information with ease, this allowed them the opportunity to form their own separate opinions before meetings without undue influences of others at the meetings (Morgan and Henrion, 1990; Rowe, 1992; Christiansen and Varnes, 2007).

Big Fish's organizational structure had several tiers. The composition of both the top and bottom levels decision makers in the new product development decision process had transformed between pre and post implementation. Prior to the implementation, the bottom level decision makers consisted of line managers and they had little involvement in new product development decisions, except the sales and marketing line managers who were enthusiastic in supplying ideas from time to time. The line managers might be consulted from time to time, but they often heard of projects that were to be launched near the end of the decision process at the same time as everyone else in the company. Their role in the new product development decisions were usually as outsiders whom were consulted upon, rather than being team members involved and conferred with as valuable inputs.

After the implementation of the decision technology, their consultation role remained the same, but they did however note the change in timing and frequency as to when their expertise were being consulted. They were consulted early on in the decision process, as early as when a brief idea was expanding, and so line managers became aware of potential new products and had better knowledge ahead of commercial launches. They also felt that they were included as part of the decision process since their inputs were seek early enough that could be incorporated into development consideration and/or commercialization. Even though there had been no change in responsibility for the line managers involved in the decision process, they had been held more accountable in their contribution in the decision process. This was certainly highlighted when the senior manager of the respective line manager was pressured by his fellow peers to manage the situation and his subordinate. This incident occurred when his subordinate did not carry out the assigned duties within the requested timeframe. In a different incident, a line manager was "charged" for putting a commercial launch at risk as a result of withholding information pertaining to a special arrangement made with the retailers in advance.

As part of the implementation a new group of individuals was created, known as the product development technologists. This unit was formed so that there was a group dedicated to carrying out the work activities involved in the decision process on a daily basis. The individuals within this unit played an important role in the decision process particularly when they were given direct responsibility for investigating and developing approved prospective projects. Not only did they collate and present project information to top level decision makers, but they also make recommendations based on information they had. The technologists maintained that new product

development decisions were not made by them. They merely provided recommendations based on the limited knowledge they had, or had gained in consultations with line managers. They were however confident that their investigation and development activities carried out were as comprehensive as they could possibly be. Furthermore, the line managers usually held higher organizational hierarchy status than the technologists and profitability was something that the line managers rather than the technologists had control over. Profitability was often affected by two separate factors: operational cost and sales revenue, which were controlled by independent line managers.

Prior to the implementation, the top level decision makers consisted of the CEO and some of his senior managers. However, most new product development decisions were largely influenced by the input and support of the CEO. Therefore, even if a senior manager had a reservation about the prospects of a project, he would not have the ability to prove or disprove another person's gut feeling and/or experience. After the implementation of the decision technology, the composition of the top level decision makers became divided into two tiers. The top level decision makers in effect consisted of only the senior managers of the firm excluding the CEO. These senior managers were responsible for making ultimate new product development decisions. The CEO himself became a separate tier that approved capital expenditure requests but not new product development decisions. The CEO was kept out of the decision making team purposely and therefore lost his right to vote in the decision process. Before the decision technology was implemented, those senior managers involved in the decision process were reluctant to either personally recommend or decide on any project progress, unless that project was an idea proposed or supported by the CEO. This subsequent change in decision structure gave the senior managers the control and power which they lacked previously when the CEO was an influential and dominating party in the prior decision process. Even though they hold the ultimate deciding vote, the senior managers insisted that they were merely following the recommendations of the technologists. They could only "advise" the technologists based on their wider and strategic view of the firm. Furthermore, they had not reversed any of the recommendations for new ideas made by the technologists, except for building, refining or sometimes intensifying the idea.

Prior to the implementation of the decision technology, new product development decisions were largely conservative. New products that were commercialized were of mainly small changes, usually in product flavoring. With the exception of the CEO, no one dared take the risk of deciding, endorsing, or developing innovative products for fear of incompetence or failure. Very few individuals in the two traditional divisions, manufacturing and operations or sales and marketing, were willing to invest their time in developing innovative products. All commercialization of new products brought about uncertainty which managers did not know how to deal with and did not want to be accountable for. Furthermore, the senior managers often did not feel staff could cope with innovative activities and hence avoided novel projects to manage and minimize risk.

However, two years into the implementation of the decision technology, the level of management insecurity and avoidance of new projects had gradually diminished. The decision technology gave senior managers new found ability to quantify as well as qualify the prospects of each project. This was possible since the tool gave them a template in which to collect certain inputs as well as present their collective opinions at a glance emphasizing the differing aspects of the project, such as manufacturability, marketability, and profitability. The amount of known information has subsequently given senior managers enough power to make decisive pronouncements about which projects should be given the priority, time, energy and resources to continue and work on (Dechow and Mouritsen, 2005). This was particularly true when the senior managers felt the structured decision process and the amount of known information could lessen the extent of risk that otherwise would have arisen from the uncertainty of new product launches.

The plan to have all senior managers involved as the top level decision makers has had a positive effect on company's management. Even though the notion began as a personal agenda by one of the senior managers to be part of the group, it was evident through the decision meetings and discussions that the group had matured and became a collective voice that was concerned about the welfare and future of the company. There has been no indication of any "finger-pointing" occurrences having taken place among the senior managers. They also became knowledgeable, respectful and appreciative of the operational issues from each manager's division as a result of meeting discussions

and dialogues among senior managers during the decision meetings. Project success was no longer a solitary responsibility restricted to a senior manager who sanctioned the project, or was limited by the individual who led the undertaking of the project as it was in the prior decision process. The decision technology has subsequently distributed the responsibility and accountability for project success across all individuals involved in the decision process. It has become a collective group effort which not only included senior managers and product development technologists, but also line managers who have the responsibility to eventually see the commercialization of new products, and the CEO who had attended each final wrap up decision meetings in order to show his support to all those involved.

7 CONCLUSION

This study found that a decision technology provided a detailed formal structure and discipline for decision makers from all levels to follow. Given the nature of uncertainty with new product launches, it behaved as a fellow colleague ensuring the risk of project failure is redistributed across all decision makers involved, rather than singling out certain individuals. The decision technology not only enabled management to execute management control vertically on their subordinates, but also horizontally towards their fellow peers. The decision technology behaved as a silent partner and encouraged all individuals to participate in the decision process even if they were of introvert character. The decision technology also gave them the confidence to tackle and launch innovative projects which they previously avoided.

This paper has extended existing literature on the use of management control within the new product development context and the use of technology as an electronic colleague that participated and redistributed the way in which accountability was accomplished. It also contributed more empirical evidence to the knowledge of technology adoption and diffusion. This in turn could professionally assist more organisations in devising and executing management controls to manage the decision process as well as their subordinates and fellow peers.

There is an inevitably caveat we could not control all elements of a case site in a case study. Therefore, some of the enablement and changes in management controls resulted from the implementation of a decision technology could not be separated from the implementation of a manual structured decision process when the case site made a conscious decision to implement both simultaneously. Ideally the research would have been conducted at a site that implemented the manual process first and the automated system subsequently. Despite this limitation, it did not change the significance in which the lessons learnt from this intensive case study could provide, as we have learnt in much ERP implementation research that talked about the use of information technology to impose formalised structure and control on business processes.

Looking into future research opportunities, collaborative case study research could be carried out at other case sites to overcome the concern that both the manual and automated decision systems were implemented simultaneously. These case sites could either be food companies that rear, farm, develop and process its own fish products, or food companies that use the same decision technology. From these collaborative data, the possible impact from the use of a decision technology at *Big Fish* could be better explained, measured and distinguished.

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