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# Cultural Changes Resulting from Information System Adoption and Use: A Case Study on New Product Development in the Consumer Food Industry

*Completed Research*

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## Abstract

This paper explores how managers acted as internal and external change agents to persuade the digital transformation and organizational culture through the different stages of food product innovation and development for consumer food products. A case study approach was adopted to collect rich data cataloging the cultural changes in the firm in their progressive adoption of an information technology for decision support and management control purposes when managing NPD processes and activities. We focused on the perspectives of senior management over two specific time periods of before and near the commercial launch of their new salmon fish products. Through the use of the analytics tool, Leximancer, we observed how the reasoning, decision making, and emphasis on senior management had changed over a six-month period. Our findings show the changes in organizational cultures after digital transformation was applied and overhauled onto their new product development process.

## Keywords

New product development; management control system; content analysis – qualitative; system champion; change agent; case study analysis

## Introduction

New Product Development (NPD) is a process where innovative ideas are investigated, developed, and tested with the intention of launching them as new products in the market (Krishnan and Ulrich, 2001). It is an important decision making process for firms to ensure they can survive and remain competitiveness in the market (Earle, 1997; Chan and Franklin, 2011). Product innovation is vital if businesses want to survive, especially in the global food market (Trail and Grunert, 1997). Unlike other industries, the intense competition in the food industry is consumer and retailer led, rather than production led (Jónsdóttir, Vesterager and Børresen, 1998). This makes the development of new food products a challenging undertaking for an industry that tends to makes lower risk decisions albeit under constant pressure to develop new products (Rudolph, 1995) and compete in a digitally and globally competitive market (Burchardt and Maisch, 2019).

The purpose and research question for this paper is to explore how managers can act as change agents who encourage system use through the different stages of food product innovation and development process for consumer food products. In particular, we focus on the influence of change actors on system use from both inside and outside the business. A case study approach was adopted to collect rich data cataloging the behaviours and perceptions of individuals in their progressive adoption of an information technology for managing their NPD process and activities. *Big Fish* is a Salmon fish producing company located in the Australasian region. We followed them through a period of six months when they were going through

intensive NPD activities. We focused on the perspectives of senior management at *Big Fish* by examining their narratives over two specific time periods when they were interviewed before and near commercial launch of new company products. The analysis of the qualitative data was performed using a text analytics tool called Leximancer for content analysis. Through this analysis approach, we uncover a number of interesting themes regarding senior management's changing behaviours and perceptions as a result of adopting an information technology for the first time to marshal the new NPD working process.

Our paper is organized in the following manner. We will cover the extant literature in the next section, and show how this has formulated our approach to this research in our research method and our findings sections. We then discuss these with regards to our research objective and finally conclude the paper. Page Size

## Literature Review

As a background to this paper, a summary of several salient topics is covered. We looked at decision making and its influence on product development by administering management controls through information technology.

Management control deals with employees' behaviors in managerial activities (Merchant and van der Stede, 2007; Malmi and Brown, 2008) and which can be influenced through a variety of mechanisms, including information technology. We recognize the application of decision support as an integral subset of management controls necessary to enable new product development (Liew, 2015). The term management control system is employed throughout this paper because the additional feature of monitoring employee behaviors, extends a decision support system and makes it, by definition, into a management control system (Malmi and Brown, 2008; King, Hartzel, Schilhavy, Melone and McGuire, 2010). To better manage and monitor subordinates' behaviors, senior management may use management controls to involve themselves in the decisional process or to evaluate and compare subordinate performances against predetermined benchmarks.

Information technology plays an essential role in creating new knowledge and enabling collaboration (Boonstra and de Vries, 2015). It is increasingly recognized and used as a tool to assist with managerial decision making (Chapman, 2005). It can direct decision-makers' attention to potential problems and solutions (Liew and Sundaram, 2009; Granlund, 2011; Dinter, 2013) and facilitate business value creations and competitive advantage (Sambamurthy and Zmud, 2000; Weill, Subramani and Broadbent, 2002; Farrell, 2003). The key issue lies with how businesses make use of information technology to help employees to realize their full potential and achieve the competitive and strategic advantage that they desire (Luftman, Lewis and Oldach, 1993) and improving the innovation process with quality at a speedier and competitive pace (Burchardt and Maisch, 2019).

We look at decision making in terms of the roles and influence, in which different players play in the decision-making process (Courtney, 2001). As such, we acknowledge the work of Vroom and Jago in their development of a decision model that illustrates the different leadership styles (Vroom and Jago, 1988). Such development also demonstrates the leadership style in an organization may move, over a certain time, from a highly autocratic style of decision making through to a more consultative phase, to finally a collaborative style of leadership in the decision-making process (King, Hartzel, *et al.*, 2010). Some areas of group-based decision support are also addressed, enabling all those involved to have a voice, as well as for the voices to be heard.

Information technology and decision support are more than just a tool in the new product development (NPD) scenario. It can behave as an electronic colleague (Arnold and Sutton, 1998), facilitating and constraining information flows (Granlund, 2011). Liew (2015), also observed a higher level of transparency and information sharing emerged, enabling more significant collaborative decision making when an information technology was adopted and used during the NPD process. Information technology can also assist companies in improving their speed of change through digitalization and thus becoming more customer-centric and improving their internal processes (Burchardt and Maisch, 2019).

In the survey conducted by Mauerhoefer, Strese, and Brettel (2017), they found the "executive champion" of information technology for NPD to be positively related to both the frequency of information technology tool use and the leveraging competence use of information technology in NPD. In this light, we see an

opportunity and are motivated to examine in more depth how the appearance and background of managers as system champions adds to and facilitates the cultural changes of the NPD process through the adoption and use of information technology solutions.

NPD is a process where innovative ideas are investigated, developed, and tested with the intention of launching them as new products in the market (Krishnan and Ulrich, 2001). There are three major types of innovative new products that are being developed by firms: radical, semi-radical, and incremental innovative products (Davila, Epstein and Robert, 2013). NPD is also a recurring decision process that requires senior management's continuous attention and approval for ideas and projects to continue and progress until commercial launch. The information generated requires frequent and regular attention from managers across all levels of the organization (Liew, 2019). In the context of NPD, middle management are responsible for providing local knowledge about the internal processes; senior management are responsible for overseeing that NPD resources are allocated fairly across different NPD projects, while lower management are responsible for investigating the finer operational details in designing for eventual productions.

The Stage-Gate™ Product Innovation Process (Stage-Gate Process) is a conceptual and operational roadmap developed from NPD best practices (Cooper, 1990). It is designed to help guide those involved in NPD to move projects from idea inception through to product launch (Cooper, 1990; Cooper, 1994). It is essentially made up of "stages" and "gates". "Stages" are investigation and development activities conducted by the project teams throughout the NPD process, and include functional team meetings. "Gates" are specific points in time when top or senior management meet, discuss and decide on the progression or termination of NPD ideas and projects. It is during these face-to-face gate meetings; project team leaders present the results and findings of specific working projects from the stages while senior management discusses and decide whether these projects should receive approval to proceed further to the next stage (Cooper, 1990; Cooper, 1994; Cooper, 2008). Gate meetings are also a formal channel for senior management to meet and sparks continual challenge and debate about the outcome of project approvals and the underlying assumptions and action plans relating to NPD. These debates may also steer the NPD strategy and the business strategy of the firm. Projects may be terminated during the NPD process and never make it through the entire process. The more complicated the innovation, the more "stages" and "gates" there are for the project. Although a widely adopted NPD practice for managing individual projects (Griffin, 1997), the Stage-Gate process is generally not being used to oversee, prioritize and allocate scarce resources across numerous projects (Cooper, 1994). With these key areas of extant literature that assisted our understanding, we now move to discuss our research method.

## Research Method

A case study approach (Silverman, 2010) was adopted to collect rich and detailed data about the use of a management control system structured through information technology for managing the process of making the necessary decisions in developing and producing new consumer food products. The case study approach is ideal for exploring issues and problems faced by organizations, by observing them in their "naturally occurring" environment over a continuous period (Silverman, 2010) without any manipulation or control from researchers (Benbasat, Goldstein and Mead, 1987). The first author collected data through face-to-face interviews, meeting observations, and data retrieved from the information technology for the meetings. A semi-structured interview style was adopted, and the interviews were guided by the meeting observations. All interviews were audio-recorded and subsequently transcribed.

## Case Site Selection

*Big Fish*<sup>1</sup> is a salmon fish production company that operates in the Australasia region. At the time of data collection, *Big Fish* employs more than 400 employees and produces 7,300 tonnes of salmon fish and \$70 million US dollars of turnover annually. It rears, farms, develops, and processes its own branded fish

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<sup>1</sup> All names mentioned throughout this article are pseudonyms to protect the privacy of those individuals involved in the research. *Big*

*Fish* is a fictional company name used throughout for ease of referring to the firm.

products from the local seawater. The company also owns and runs its own breeding facilities and hatcheries. Half of the fish harvested were sold locally while the other half were exported.

*Big Fish* was chosen for this study because it used an information technology, named *Accolade*, extensively for NPD. *Accolade* is a commercial software product designed to manage and coordinate NPD activities and tasks. It comes embedded with the widely used NPD process called the Stage-Gate Product Innovation Process (Griffin, 1997). It functions as a process tool that guides the project teams to work through various steps and tasks and as a project management tool that assists the firm to manage the NPD process. The tool is adopted widely in a number of industries and large companies globally (Sopheon, 2010). At the time of investigation, the information system had been installed on-site at *Big Fish* for nearly two years, with initial teething issues resolved, and had been progressively used for managing NPD for just over a year when the data collection period began.

In this paper, we focus on the perspectives of senior management and over two specific time periods across six months during the year of 2009. These two time periods are categorized as before commercial launch (before launch) and near commercial launch (near launch) of their new consumer food products. Interviews in the before launch were conducted in the first six weeks of the six months period (in May and June 2009), while those in the near launch were conducted in the last six weeks of the six months period (in September and October 2009). A total of eight interviews were conducted with all five senior managers from the senior management team. Four interviews were conducted in each time period. Though interviewed, the perspective of the chief executive officer was intentionally omitted because he was not directly involved in the decision-making process nor the use of the information technology for NPD.

### **Data Analysis**

To understand the perspectives of the senior management team, the interview transcripts were analyzed using a software called Leximancer for content analysis. Leximancer is a text analytics tool that "uses word occurrence and co-occurrence counts to extract major thematic and conceptual content" (Angus, Rintel and Wiles, 2013, p262) and is gaining popularity for analyzing qualitative data (Crofts and Bisman, 2010) including lengthy and multiple interview transcriptions (Penn-Edwards, 2010; Sotiriadou, Brouwers and Le, 2014). The main concepts uncovered from the interview text are presented in the form of a conceptual map showing how these main concepts are related to each other and how the major themes are formed among different clusters of concepts (Leximancer, 2011; Leximancer, 2013). Leximancer analyses directly from the input text of single or multiple files. It is noted that Leximancer displays the importance of the theme nodes not by their theme sizes but by their colors. In other words, the themes on a conceptual map produced by Leximancer are heat-mapped. The most important themes are shown in hot colors, such as red and orange. The less important themes are shown in cold colors such as blue and green. The connectivity percentage for each of the themes demonstrates the relative importance of the themes within the dataset. The most important theme that is the top theme will be at 100%. Contrast this to the relevance percentage for each of the concepts which demonstrate the relative frequency of occurrence of a concept within a list of concepts within the dataset. The most frequent concept will always be at 100%. One major difference between Leximancer and NVivo is that Leximancer provides automated analysis with minimal intervention and biases from researchers; whereas NVivo requires manual handling of data, thereby allows increased biases from researchers (Sotiriadou, Brouwers, *et al.*, 2014).

To ensure that the frequency and significance of the main concepts were words articulated by the interviewees, the interviewer's questions and prompts were removed from the analysis. Furthermore, the interview questions were centered on the NPD process adopted and their perceptions of the usefulness of Stage-Gate and/or the *Accolade* system for managing the NPD process at their firm. Even though meetings were observed as part of the data collection, only the interview transcripts are scrutinized and considered in this paper. Nonetheless, the interviews were guided by the meeting observations.

### **Results**

In this section, we discuss the content analysis results produced by Leximancer in the following sub-sections. The first contains the discussion of some elements of the 9 themes revealed from the before launch period. The second sub-section contains the discussion some of the 8 themes revealed from the near launch period.



Figure 1: Concept Map on Before Launch Period

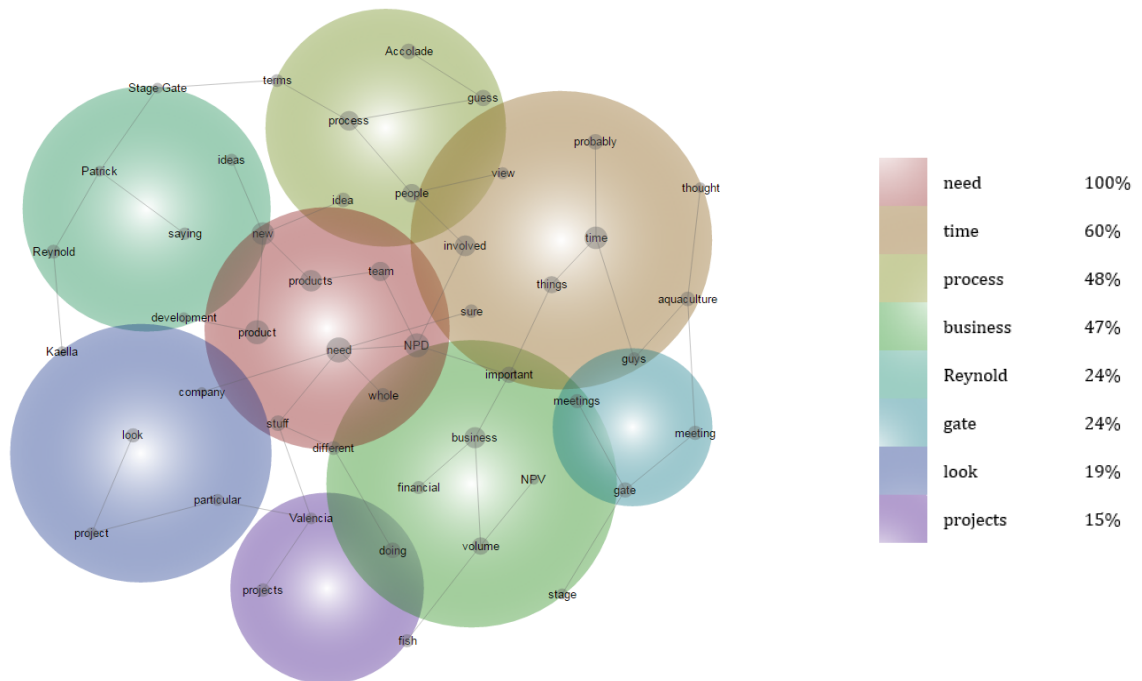


Figure 2: Concept Map on Near Launch Period

**Before Launch**

In the before launch period, 58 concepts were revealed and clustered into 9 themes. A content map produced by Leximancer illustrating these 9 themes (by heat-mapped colors) and their relationships among the 58 concepts is presented in Figure 1. A narrative describing the meaning behind each theme is next.

**Business:** The focus of the business at the time was about having a good process for developing new fish products to compete in the market. The importance of NPD was ingrained in many people's minds and not just documented in the strategic plan.

*“But as the fundamentals of a business change or market conditions [...] some things start to be a bit more headlined. And so 3 or 4 years ago [...] we started to recognise [...] NPD particularly was important [to us ...] for both business survival and business success [...] we started to quantify what we wanted from it and then we resourced.”* (Patrick, Senior Manager #2, before launch).

**Product(s):** Senior managers believed they needed to be creative in developing the right food products for the market so that business could continue and thrive. Nonetheless, being innovative in the food industry is not about altering the food molecules but in developing clever packaging, for example in improving the shelf life of a fresh food product. They also felt they needed to move away from simply providing commodity food products. Packaging was previously an afterthought before the implementation of *Accolade*. Packaging considerations are now incorporated into the design process.

The systematic approach of Stage-Gate in *Accolade* helped them to better design their products for market launch. Getting the products ready for market launch in a reasonably short timeframe was important but minimizing a stream of design modifications after launch was even more important. The stream of design modifications after launch illustrated how ill-prepared their development process was previously.

*“we don't do so much [tweaking now]. We tend to design a lot of the elements that we would subsequently change in the market, we do that prior to launch now. We do it much more successfully. We lock down the quality and packaging and specification, all those parameters.* (Dwayne, Senior Manager #1, before launch).

**Whole:** As the salmon market matured and developed, they wanted to differentiate themselves from other suppliers and to develop their business brand. They desired to focus more on value-added products because they believed these value-added products would assist them in becoming a true food producer and continue surviving in the food industry and not be merely a seafood farmer producing whole fish. *Accolade* enabled these aspirations.

**People:** The people involved in NPD were required to complete the deliverables in *Accolade*, such as filling in their projected markets and sales prospects, so that senior managers who are the gatekeepers could review and evaluate the potentials for each idea or project on hand. Nonetheless the changed process in NPD had allowed anyone working in the company, even a fisherman, to contribute and voice their idea. It was the gatekeepers' role in deciding the strategic fit of the idea and prioritizing the necessary resources to investigate and work through the finer details of the idea.

*“project members are building the information [for] the gatekeepers [...] to review it and critique it and examine it accordingly [without the need to] do their own research or to require their staff to do the research [...] the gatekeepers are more about the quality of the outputs [...] on how good that deliverable is. Is it [...] complete, is it of higher quality, is it on the right track?”* (Patrick, Senior Manager #2, before launch).

**System:** A system on its own would not produce a miracle without the people working behind it. It is important that the people involved are understanding what the *Accolade* system was designed for and why it was chosen, and was also given the time and resources to learn and work through a new tool. They went beyond training the users on how to use the tool but also on the underlying principles and practices behind the Stage-Gate process.

*“you have to allow people the time and the resource to do the work properly, and then you can really see it flourish. And I can see that's probably where a lot of companies would struggle [because] they [...] don't give people the time away from their usual roles to work on this [NPD project] it might fall over as [...] a process.* (Reynold, Senior Manager #5, before launch).

**Stage-Gate:** To them, Stage-Gate was an important means for them to improve upon their previously chaotic NPD process so that they could realize their goals in developing fruitful new products. They had read books and attended training seminars on Stage-Gate. They learned about the struggles other companies have had in implementing Stage-Gate with human coordination efforts. To them, *Accolade* was a necessary tool for them in adhering to Stage-Gate, and the time to realize and refine a new process.

*“we debated [...] whether we’d do Stage-Gate without Accolade and decided that we’d just cut to the chase and use Accolade as the enabler. [...] Give us 2 or 3 more years and it’ll be a weapon in the company for how we do things. [...] the thing to be remembered is that these processes take a while to bed in, no matter what degree of commitment you’ve got. [...] we’re still early in the process of making this [Accolade] the powerful business tool that it will become.”* (Patrick, Senior Manager #2, before launch).

**Robert Cooper:** Robert Cooper is the person behind Stage-Gate. Even though he had never visited the company nor attended any gate meetings, he was a prominent character in their company and was often mentioned in the observed meetings. He was their point of reference to NPD. This conviction came from the people having read his books, and some attended his Stage-Gate seminar.

*“And then Kaella and I [...] went to that [Robert Cooper seminar] and he convinced us [...] Stage-Gate was an important thing to do but also at that point we discovered there was software.”* (Dwayne, Senior Manager #1, before launch).

**Idea:** Stage-Gate changed the way ideas were contributed and managed through the development process. *Accolade* allowed them to easily monitor the development progress.

*“in the old days [if] people [...] have an idea [they would] start to run with it [...]it may get momentum, and people will get excited for a while about it [...] or people just lose interest and [the idea] will just sit there and do nothing.”* (Reynold, Senior Manager #5, before launch).

### **Near Launch**

In the near launch period, 48 concepts were revealed and clustered into 8 themes. A content map produced by Leximancer illustrating these 8 themes (by heat-mapped colors) and their relationships among the 48 concepts are presented in Figure 2. This sub-section continues to describe the meaning behind each theme with supporting interview quotes from near launch.

**Need:** As the market launch date of new products drew near, the focus was on the NPD team having carried out the essential homework on NPD so that the new products were ready for and able to soon capitalize upon market launch. There needs to be a clear understanding of the cost implication from the uniqueness of their fish species.

**Time:** It took some time to get things going in NPD. There was initially an argument whether to include aquaculture view in the NPD discussions so that all voices were represented and considered. Having that voice could and did strengthen the relationships and cohesiveness among the senior management team on the topic of NPD. It also highlighted that similar views on NPD were often shared despite coming from senior managers of different functional departments.

*“Every once in a while you get a difference. [...] sometimes, it’s just a different point of view. But most of the time we’re pretty focused. Which I think is quite interesting. It shows there’s actually alignment between these two different parts of the organization. In terms of the way we think. Which I believe has been a good thing.”* (Simeon, Senior Manager #3, near launch).

**Process:** The process was about the people interacting with the *Accolade* system (i.e., the information technology). *Accolade* took the guesswork out of NPD and helped the people involved in the process to focus efficiently on spending their time, energy, and resources in developing ideas, having better communication, and maximizing their chances of a successful launch.

*“The disciplines of the process meant that communication is much better, much more transparent, and we’ve got good processes in place. Whereas it was somewhat frustrating before, difficult to make progress. [...] Frustrating. [...] Not achieving new products to launch, and not being successful [from the launch].”* (Benjamin, Senior Manager #4, first interview near launch).

**Business:** In the first six weeks of the six months period before launch, the senior managers described the word business in terms of developing successful products for their business. Now, as the market launch is near (in the last/final six weeks of the six months period near launch), the word business was narrowed to describe the volume and financial return from new products that are important to growing the business. They wanted NPD teams to focus their time and energy on ideas that consume a large volume of fish. Only



through a large volume of fish, they would have more favorable net present value (NPV) and better chances of financial return from their NPD efforts.

*“Well the analysis comes through Accolade, and that’s what we’re relying on, so checking that, and the validity of that, and viewing the information that the team are putting in there. And does that make sense, have they got their costings right? Are they confident about the volumes that they think they can get? So yeah quite often we’re asking those sorts of questions.”* (Benjamin, Senior Manager #4, first interview near launch).

**Reynold:** Reynold played a big part in introducing the Stage-Gate process to the firm by recommending Robert Cooper and his books before the launch period. His role in the near launch period was about managing the people and the development process of the Stage-Gate process. This involved handling the gatekeepers during the gate meetings and managing the NPD project team leaders together with his subordinate Kaella, who focused on the finer operational details in the individual projects.

**Gate:** The gate meetings played a critical role in allowing the five individuals from the senior management team in their meeting up and discussing the progression of the NPD projects. In the before launch period, senior managers described gate in terms of the mechanics of the Stage-Gate process. Now that it was near launch, they described gate in terms of an opportunity to raise questions with the project team leaders and have open discussions and knowledge sharing with their fellow gatekeepers.

*“Usually what I find is we learn a lot at the gate meeting and then that’ll spark a discussion about something which became the sharing of knowledge between the gatekeepers.”* (Benjamin, Senior Manager #4, second interview near launch).

**Look:** As the senior managers examined the projects, they wanted to see the company succeed and grow. What was never discussed in any formal interview was that four members of the senior management team had some shares in the company, which gave a slightly deeper meaning to 'having a sense of ownership.' Reynold was the only exception because he was, in effect, a middle manager within the organization except in NPD.

*“Because I’m not just about finance, I’m about the company being successful. And I want to see resource, and energy, and effort where it’s applied, being applied successfully and then the better the business is in its entirety.”* (Benjamin, Senior Manager #4, first interview near launch).

**Projects:** Again, the projects were about the fish. Nonetheless, the focus was no longer on whole fish, but on value-added fish products instead to overcome the cost implication from their unique fish species. Valencia was one of the NPD project team leaders who led two of the three projects to market launch. Hence, there had been numerous discussions made describing how a gatekeeper should evaluate a project and ask clarification questions before a gate meeting like they were supposed to do so before a gate meeting.

## Discussion and Conclusion

In our analysis, we compared different perspectives indicated in the voices between before and near launch timings and found significant differences and foci in the conversations. We note the voices of senior managers and the significance of different change agents at each timing. Poignant changes in attitudes between the two time periods where the focus related to the software itself in the before launch time period and to the NPD process in the subsequent near launch time period. Such changes influenced the senior team in their decision making, and it was their perception that the use of this embedded Stage-Gate process increased the probability of a successful market launch. This suggests that there has been a team-building and learning process where functional leaders of the company began to form and then performed as a collective group. In the near launch time period this was shown through the sharing of issues, understanding cross-departmental concerns, and the breaking down of borders and boundaries throughout the company as a whole. This has led senior managers to a greater sense of ownership of the NPD process through a more transparent sharing of information and reducing of silos within the business. The processes enabled group support and the move from a highly structured, siloed decision making culture to that of a cooperative model (Vroom and Jago, 1988). We also found elements of decision support through the use of *Accolade* had significant impacts on higher management decisions. However, in the context of *Big Fish*, the element of decision support is much more pervasive throughout the whole management process. Therefore, we suggest that the *Accolade* system supports the whole managerial decision support process.

This paper described the passage and transformation of *Big Fish* as they developed new and novel ways to manage their process of new food product innovation through the adoption and use of a new digital solution. The paper looked at the perceptions of senior management at two time periods in an NPD process, before and near commercial launch, and identified surprising insights into the cultural changes in the company's working practices. Individuals understood more clearly the space and storage constraints of the retailer, which influenced their subsequent packaging decisions. By collaborating cross-functionally within, uncovering, and incorporating retailers' constraints in their design decisions, they increased the attractiveness and practicality of their products appearing and continuing in the retail space. Working practices ranged from the reliance on an external expert "Robert Cooper" to resilience within the company based on the thoughtful and skilled work of an internal agent "Reynold." The paper identified the breakdown of the silos within the organization allowing for information sharing and cross-department collaboration. The break down in silos had helped improved the workflow for NPD and the clarity in the organization's decision making to effectively manage the NPD process. It showed clearly through the qualitative analysis of senior managers' interview narratives that there was a progression in their perceptions and enthusiasm between the two time periods highlighting the dysfunctional areas and the great strides in improvement that had occurred in a short period of time.

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