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Factors that Drive Success in Collaborative Product Development

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Abstract

Collaborative product development (CPD) activities have become increasingly common to keep up with market demands, shorten development cycle times, and improve overall competitiveness. This study examines the success factors that affect CPD to investigate how hi-tech organizations align technical and managerial skills to achieve development process effectiveness. A monoview strategy using data from qualitative interviews, examines an engineering project in a CPD environment within the New Zealand context. The study identifies factors within four contexts – management, cross-functional teams, processes, and supporting tools – that interact with each other to achieve improved CPD performance and project outcome. Company managements aim to create an environment that enable information flow between cross-functional teams, integrate professional skills and talents with the product development process and adopt technology-mediated supporting tools to maximize productivity and achieve better innovation results through collaboration.

Introduction

In the current global environment, collaborative product development (CPD) strategies have been adopted by manufacturing organizations to keep up with market demands, shorten development cycle times and improve overall competitiveness [1, 2]. There is an increase in collaboration between different groups within the same organization or between different teams in separate organizations [3]. These firms pool in skills and technologies to accelerate the product design and development process to achieve shared goals. Firms learn to sustain together in markets where innovation, high quality, low cost, and time-to-market are all critical. Further, managers, designers and manufacturers are endowed with new opportunities to participate in global design chains, use third party specialist skills and coordinate with international partners to grow their business in diverse markets. However, many companies have underestimated the requirement of establishing good collaboration processes across the distributed teams, and studies have shown that misalignment of processes introduces significant challenges to collaborative projects [4]. Moreover, there are certain disincentives associated with collaboration. Research indicates collaboration generally involves large costs associated with significant breadth in technical knowledge, skills and resources to achieve successful operations [5, 6]. Additional concerns of information security and breach of intellectual property have been raised [7]. Therefore, overcoming these risks to achieve CPD success is not without challenges.

Prior research has put strong focus on measuring and analyzing a variety of critical success factors (CSFs) in the collaborative arenas for product development success [e.g., 8, 9-11]. These studies emphasize various organizational contexts comprising management imperatives, team efforts, process set ups, and supporting tools for achieving better results through collaboration. However, the lists of CSFs vary in these studies due to the unique nature of each collaborating case study. Also, the ratings used for evaluating CSFs in these studies are viewed from a multiview strategy that involves perspectives of different categories of informants (e.g., consumers, R&D teams, researcher's self-report, other stakeholders).

This study investigates the critical factors responsible for achieving CPD success in an organizational context. The study has adopted a monoview strategy to include the perspectives of one category of informants for achieving required relevance and rigor into the evaluation of the research constructs [12]. The informants chosen are R&D personnel working in a hi-tech engineering project. Thus, our research objective is: *To investigate and explore the critical success factors in a collaborative product development environment by adopting a monoview strategy for a hi-tech engineering project within a New Zealand context.*

In the following section, we summarize prior literature related to CPD and outline the four contexts for managing projects during the development process. Next, based on existing literature, a conceptual framework listing the CSFs within the CPD environment is developed and explained. The research method and unit of analysis is explained next. A brief overview of the project is presented to provide a better understanding of the study's research domain. The findings are analyzed and discussed in the subsequent section. The final section focuses on this study's implications to research and practice.

Theoretical Background

New product development (NPD) is a term used to describe the complete process of transforming new ideas into successful products that meet customer expectations and help the business to deliver cost effectively [13]. The fundamental three components of NPD are identified as *doing the project right, doing the right project* and *measuring the result* [14, 15]. However, product development is a murky area – involving numerous trial and error scenarios, ongoing learning from mistakes, or repeating experiments with different parameters within a fixed time frame – all of which have a large element of uncertainty. Furthermore, product requirements are often changing during the development stage, adding to project uncertainty. More recently inter-organizational or CPD projects involving outsourcing, subcontracting, and partnerships have become increasingly common. The process of organizations breaking through barriers to promote parallel approaches of innovation through multiple users in NPD is called "collaborative innovation"

[16, 17]. Organizations rely on each other to share product knowledge, deliver new product lines, and work together in a cost effective way. CPD however, cannot be underestimated, and requires effective product and project management to bring together the mix of intellectual, technical, and industrial skills and resources from different sites to achieve the desired outcome [18, 19].

The objective of product development businesses is to provide an environment conducive for generating and implementing new ideas. This is easily said than done as in geographically dispersed R&D teams, the project schedule has a much higher risk of falling apart leading to late delivery of product and loss of profit [4]. Effective project management strategy across collaborative boundaries needs to be in place. Herbsleb and Grinter [20] recommend two solutions to integrate different sites for better management. First, is to enforce all sites to use the same process, and second, to let everyone use their own process, which is a faster way to progress a project. However, in both solutions, it is crucial for the project management to delegate and specify the project tasks [21] defining the decision-making authority for each project [22]. Project-experienced *senior management* provide a collaborative environment for enabling information flow between *cross-functional teams* of different partners to integrate their skills and talents with their innovative product development *process* through appropriate use of technology-mediated *supporting tools* [22]. Thus, management, cross-functional teams, process and supporting tools all play an important role for delivering new ideas and products to the market in a cost effective way.

Senior Management Role in Collaborative Product Development

Prior studies have stated senior management commitment and involvement to have a positive impact on successful collaborative project outcome [21, 23, 24]. Senior management comprises team leaders who make decisions and decide future directions for product development and innovation. They have "the ability to successfully integrate and maximize available resources within the internal and external environment for the attainment of organizational or societal goals" [25, p. 27]. Senior management plays a strategic role in specifying and providing directions for selecting project partners, identifying the project portfolio, bringing about cultural compatibility, and resource availability in the early stage of collaboration [3, 26]. Different types of projects require different levels of resources, and this situation can lead the organization to a serious position where over or under commitment of resources could occur. Cooper, Edgett and Kleinschmidt [27] note that a common challenge for senior management is to implement sound portfolio management techniques for ensuring that the project fits within the organization's capability and strategy. This helps in prioritizing projects and allocating resources effectively between multiple product development teams [28, 29]. The management's role is also to support the teams, monitor their progress and ensure that the project progresses according to its scheduled plan and that the project outcome meets the set project requirements [30].

Cross-functional Teams in Collaborative Environments

Cross-functional teams involve the integration of multiple talents and skills and the interaction between team members for sharing ideas and achieving a high level of collaboration to produce creative new products. In the collaborative environment, team members are often encouraged to step out of their comfort zone and stretch their skills and perspectives in exchanging ideas and solving problems. Edward [31] asserts that to increase technological innovativeness in a cross-functional team environment, it is important to identify reasonable project goals at the project outset, empower project team members, establish a balanced project climate, and allocate right amount of resources. As a result, the organization attains an improved R&D focus with a better team and innovation outcome, a shorter product life cycle, and a stronger global competitive advantage [32, 33]. A NPD team consists of members with diverse backgrounds and temperaments, which can create conflicts, tensions, and communication difficulties into the groups. A successful management that can deal with such diverse teams has been identified as one of the important factors for new product successes [34]. Extensive academic research has covered different areas in cross-functional teams such as trust, culture, communication, information, and integration [35-37]. In collaborative teams, the integration between marketing and other departments has also been highlighted as having a significant impact on the success of NPD [38].

Management of Processes in Collaborative Product Development

In geographically distributed product development if communication, design, manufacture, and procurement processes are not in place, there can be significant costs and risks associated for the collaborating parties [39-41]. For example, the setting up of collaboration, evaluating the partners, selecting the resources, and monitoring the progress can consume a significant amount of time for senior management. Information security of intellectual property is another area of concern for collaborating partners. Farr and Fischer [42, p. 55] suggest that some companies might be reluctant to create "potential competitors for themselves", or depend on a key supplier or partner. Including a management framework in contracts for collaborative agreements can mitigate risks and compensate for lack of trust among technologists [7]. Performance measurements through regular meetings, setting of milestones and delivery schedules are put into practice through process controls. It is essential for management to plan for the inevitable unknowns that could arise and result in unacceptable budget matters and schedule overruns [22].

Supporting Tools for Collaborative Product Developments

It is often a challenge for an organization to adopt a sound innovation process strategy, which can help different users work together in parallel to develop new ideas. Under these circumstances, the collaborating companies must ensure that the knowledge and ideas are effectively shared through use of appropriate technology-mediated tools (e.g., email, electronic sign-off documents, database library, automated change request, and project scheduler). Group information and communication technology (ICT) tools are reshaping the way

collaborative work is being executed. Ideas are now portable and can be applied to shared task product, enabling mutual knowledge creation [43], as multiple users can contribute to innovative ideas and create knowledge database further extending innovation networks across sites. However, inadequacies in ICT tools may cause low interaction participation or even stoppage of work across distributed teams, and accordingly organizations have recognized the importance of ICT tools for improving learning and knowledge sharing across distances in collaborative projects. Thus, technology adaptation is necessary in project teams and management needs to ensure availability of appropriate ICT tools for product task design and support team interaction [44]. Leornardi and Bailey [43] suggest that engineering tasks require considerable sending and receiving of information, and it is advisable to follow up on information through voice tools (e.g., telephone).

Conceptual Framework

Next, we articulate a conceptual framework based on the literature review, proposing what should drive the success of collaborative product development. The framework (shown in Figure 1) outlines four contexts – management, team, process, and supporting tools. Each context comprises individual constructs that influence the outcome of collaborative product development. Forty-one constructs have been identified as critical for achieving positive outcomes and success in a CPD environment. The CSFs described in prior literature are ubiquitous, without differentiating them into specific contexts. Our framework has extended understanding of existing literature by defining four contexts for CPD, and aligning CSFs within each context. It provides contextual clarity as it displays an overall view of the CSFs across the four contexts. Thus, the framework is generic and can be adapted for other practice domains. This framework has been used as a theoretical and methodological guide for the conduct of our study to evaluate the success factors within each contextual area.

Research Methodology

The research has a specific focus on product development practices in New Zealand R&D firms. Accordingly, a monoview strategy has been adopted targeting R&D personnel in a hi-tech engineering firm based in New Zealand (NZ). The unit of analysis for this study is at the project level. Hobday [45] has introduced the methodology for conducting case studies at the project level instead of organizational level, because project level discussion can provide reflection from more specialized and hands-on people. Thus, the project level scope adds relevance as well as information-rich insight into this research. Purposeful sampling method [46] has been used to select the company engaged in CPD in distributed locations. Ten semi-structured interviews were conducted with R&D professionals working in an engineering project in a hi-tech organization involved in design and manufacture of electronic devices. The interviews were conducted at the company site, each lasting between 45 to 90 minutes. All of the interviews were recorded and transcribed for in-depth evaluation. The participants included varying positions within the development teams, from company executives, R&D R&D managers, project managers, and product development engineers to capture a holistic account of the CPD processes from the whole R&D division perspective. Insights were gained into how the CSFs contribute towards achieving a successful CPD process based upon the beliefs, and convictions of the participants. The data has been analyzed, and inferential material reported in this paper.

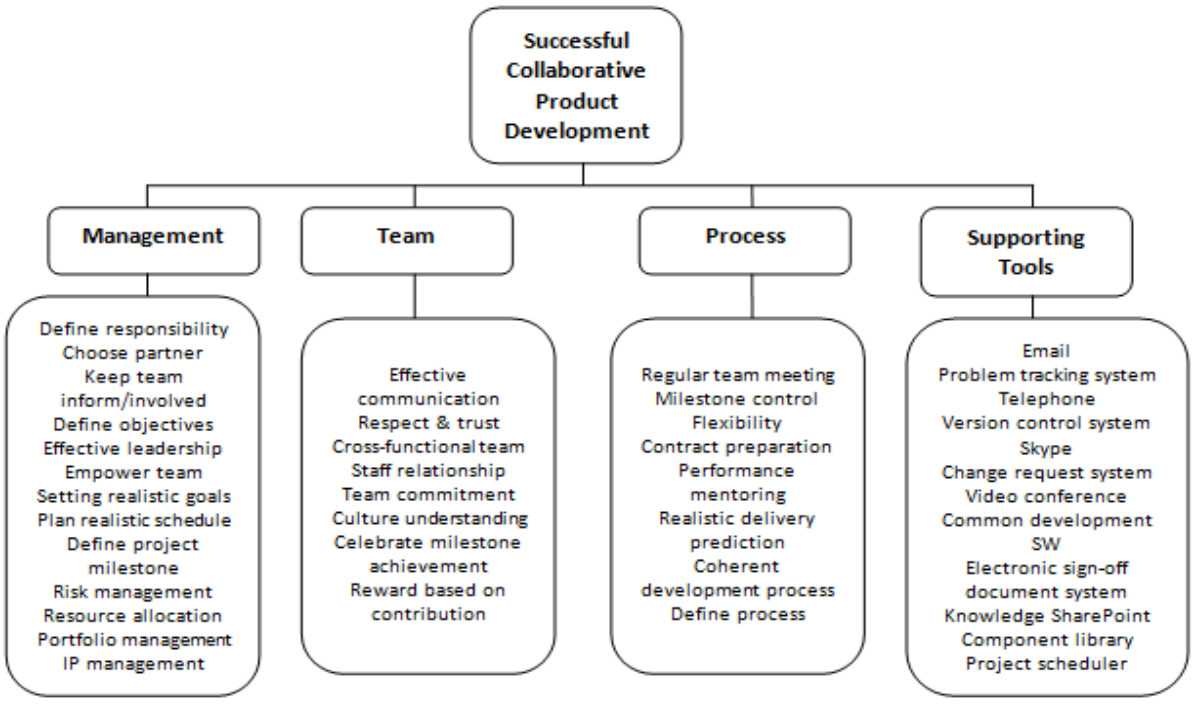

Figure 1: CSF framework for collaborative product development

Company Background

Alpha is a multinational engineering company and an original design manufacturer (ODM) of high-tech consumer electronic products. Alpha has 2500 employees globally. Its R&D center and manufacturing facilities in NZ employ around 150 full-time equivalent people. Alpha has integrated three subsidiary companies comprising four design centers, seven product brands in three continents and eight different time zones. Over the past few years, Alpha has developed into one of the global leaders in the consumer electronic market. As a multinational product development company, Alpha always strives to deliver excellent quality products to the market at the fastest speed with newest technologies and features. With headquarters based in Norway, Alpha has three design centers located in Auckland (NZ), Tulsa (US), and Ensenada (Mexico).

Case Study

One project was selected from Alpha as a case study that belonged to a CPD environment. An overview of the case study is presented and discussed in this section. The case explores the contextual success factors influencing the outcome of the collaboration practice through the CPD project. The principal aim of this case study is to help develop the context of collaboration practices related to an inter/intra-organizational collaboration in a globally distributed environment.

The selected case from Alpha is a complex and innovative product development project with new technology embedded and is predominantly undertaken by its R&D team in Auckland. The NPD process at Alpha is developed from Cooper's [47] 'Stage and Gate' model comprising five main stages – (1) definition of product concept, (2) assessment of feasibility, market potential, and prioritization, (3) product realization, (4) ramp-up and market introduction, and (5) lifecycle management (Figure 2).

The project has been under development for the past two years and involves more than twenty people working in areas such as hardware, software, and mechanical design from three global locations. Key development managers and engineers were interviewed to gain insights on the CSFs considered important for CPD success in their current project scenario. Interviews revealed that CPD projects have some unique factors, both internal and external, influencing their success. Internal factors such as company size, resources availability, and growth capabilities influence the project outcomes. External factors include competition, proximity to markets, price margin pressure, time-to-market, responsiveness to customer needs, and product lifecycles.

Findings

The intra-organizational collaboration practices influencing CPD success have been collated in four identified contexts – management, team, process, and supporting tools – discussed next.

Management Practices

Interview data has revealed that intra-organizational collaborating groups need clear goals and objectives pre-defined before project launch. Many informants emphasized that 'defining the responsibilities' is critical for collaboration success. This improves the ability to leverage the core competencies of distributed teams by clearly identifying the deliverables. The R&D manager explained the concept of center of competence (COC) for defining responsibilities across the company. Specialized COC are defined as an R&D strategy differentiating the team's location-focus on building core competencies in specific development areas. The goal of collaboration is to integrate the competencies from multiple teams together to develop and deliver better products faster to market. The R&D manager explained that projects undertaken in an intra-organizational alliance network imply that the management's primary responsibility focuses towards aligning complementary strategic capabilities across COCs to improve development outcomes and achieve better competitiveness in the market. Careful assessment of the competence of each group and 'choose the right partner' from one or more COCs is a top priority for the senior management.

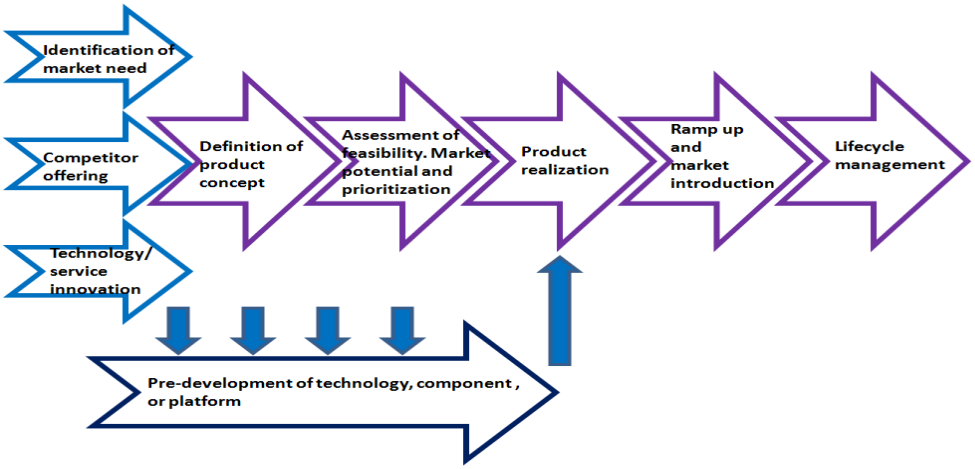

Figure 2: Alpha's new product development process framework

A project manager considered the success factor 'keep them involved and informed' as "*a very good practice*". He stated that in their case of intra-organizational collaboration, the management has especially identified core team members from each location and particularly "*keeps them involved and informed*" throughout the project. Another project manager noted that collaborative projects involve a significant spread of knowledge and involvement from different groups of people hence, it becomes hard to keep everyone informed. He expressed that management must make adequate efforts to maintain communication within the core team members to keep the project on schedule and within realistic goals. Many informants thought 'effective leadership' is one of the key CSFs for collaboration. *"Effective leaders communicate clear values and goals throughout the company."* Alpha has established five common values across the company called *"5C"* leading the company to success in global collaborations. These represent **c**ustomer satisfaction, **c**ulture of passion and performance, **c**ollaboration, **c**ommercial edge, and **c**redibility. An important finding is the link between 'empowering the team' and 'trust' in collaboration. The R&D manager noted that the CEO of the company encourages managers to make decisions and rewards those who achieve results. A number of strategic decisions implemented over the past few years have helped the company during the current economic downturn. The R&D manager further explained that in intra-organizational collaboration, the remote work relationship often caused people to complain because they could not directly communicate or work with each other together. The most efficient way to resolve this was to build communication channels and improve trust between teams.

Team Practices

Essentially, collaborations are developed through the involvement of individuals and therefore, it was not surprising to see a lot of focus given towards the team and relationship building in collaboration. The establishment of 'effective communication' channel between collaborating partners is fundamental in distributed project management. Participants from differing hierarchies confirmed that effective communication between the management and the team members are of the utmost importance for a project's success in a collaborative environment. The findings identified an important link between 'effective communication' and the communication supporting tools such as telephone, Skype, email, and video conferencing. A common response from participants was that by applying such supportive tools, the communication link between the distributed design centers could be established in a more effective manner. Working in 'cross-functional teams' is another CSF identified as important for CPD. Essentially, collaboration success is achieved by bringing individuals and groups with differing expertise together. Findings suggest a considerable amount of focus has been drawn into building such cross-functional teams at Alpha, since as per participants it was not easy to integrate the three design centers to work on the same project. *"It is all about teamwork, respect and trust."*

Process Practices

'Frequent team meetings' are a common practice for distributed product development, in order to maintain efficient communication between teams. The regular face-to-face meetings are difficult to arrange due to the geographical distance between the distributed teams. Additionally, as the three project groups are located in different time zones, this adds further difficulty to communication. The project manager stated that 'frequent team meetings' enable managers and the team members to get a clear picture of project progress and status of deliverables. Frequent team meetings have allowed synchronization between development teams and added transparency to knowledge sharing processes.

Another CSF, 'meeting the milestones' has been noted as a significant indicator for measuring and reviewing project progress. Alpha uses Cooper's (1994) Stage-Gate process framework as its main NPD strategy. At Alpha, the engineering validation (EV), design validation (DV), production validation (PV), and field validation (FV) are the main milestone controls for projects. It is imperative for the project team to stay on track of these key milestones. If there is anything affecting the project to miss a milestone such as issues with cost, time, or scope, an 'out of bound' notice is issued to the top management for quick actions to overcome the problem. Due to the nature of the development process, the project manager noted that it was difficult to predict the possible issues and outcomes during the course of a project, and therefore highlighted the need for having a certain degree of 'flexibility' in the process. Other Alpha respondents who suggested that the project plan must allow for contingencies reiterated this aspect. Therefore, 'contract preparation' that constitutes an important part of project definition in the initial stages of the NPD process is also identified as a CSF. Contract preparation involves defining detailed requirements such as project schedule, formation of the team, key milestones, budget, basic business criteria, risk assessment, and work estimations.

Supporting Tools

Email, telephone, Skype and video conferencing represent different forms of communication media. Various participants have highlighted them all. As regards their usage in the distributed environment, the participants expressed contradictory opinions. Some suggested that communication through email is beneficial because it is more formal compared to telephone and Skype, and also provides a historical record of the communication. However, some other participants complained that emails contribute to issues such as delayed responses, misunderstanding of messages, and is sometimes more time consuming in managing problems.

In the intra-organizational collaboration at Alpha, their three design centers share compatible information system tools such as common development software, SharePoint, version control system, problem tracking system, and change request system. All of these tools improve effectiveness in collaboration and add value to the processes. This has benefited the development process through faster response time, synchronizing the project development, higher data integrity and easier resource sharing. Several project managers and development engineers noted an IT based 'issue tracking system' as being under regular usage. It is a computer software package that allows recording and maintenance of issues occurring in the project. The end-user

of this problem tracking system can create new issues, assign the issue to the appropriate person for adding more details to the existing issue or resolve the issue. Anytime the user of the system makes a change, the issue tracking system records the action and the person who made the change, to maintain a history of the actions taken. Greater project visibility and knowledge sharing are achieved from using this tool in CPD.

Discussion

A number of factors have been identified for achieving success in collaborative product development. The management context has revealed that within the product development environment, selection of the right partner is critical for providing complementary competences to organizations through collaboration. The COC strategy for differentiating the team's location-focus in specific development areas has proved beneficial in building specialized core competency. Contribution from partners can add resource and strength to the cooperation and outcomes. The finding confirms the importance given to the selection of the right partner [48], to achieve better intra and inter-organizational cooperation that speeds up the product development process. Defining of responsibilities and objectives for all parties, details the basic requirements of identifying and fixing the roles and duties within the collaborating teams, which are particularly critical at the commencement of any project. An important finding indicates that responsibilities are defined and entrusted through the COCs in this study, where experienced and technical staff are accountable for resolving issues and maintaining partnerships. Additionally, having a certain degree of flexibility can introduce extra freedom to implement changes and the ability to respond adequately in the collaboration process. This is especially applicable to collaborating small business units or small-scale companies. Effective leadership is another core competency for company managements. In particular, when a project suffers from uncertainties or hardships, clear strategic direction from the senior management can guide the organization to recovery. Existing research also indicates that effective leadership can bring together a mix of skills and resources across organizational boundaries and achieve product development success [22].

With regard to team context, respect and trust is one of the fundamental success factors, as revealed from the study. This factor is especially important for projects with new partners or collaborating with partners from a different culture**.** Having a trustworthy relationship between partners is truly the requirement for mutual cooperation. There is a wide coverage on team commitment and cross-functional teams in existing academic research [e.g., 34, 35, 38]. In this empirical study, establishing a team commitment within the team, and building cross-functional teams are recognized as being significant for people from different backgrounds working together and highlighted as vital towards achieving success within CPD.

The factors related to the process controls presented in this study have an impact on the CPD process. Regular team meetings are a common practice that enhances communication between CPD teams. This is particularly needed if the collaborating teams are large and frequent communication between the teams is required. Paasivaara and Lassenius [4] reveal similar findings in their research and note that maintaining regular team meetings across all organizational levels is a useful collaborating practice. Contract preparation and signing off is an essential element of product development process. Detailed documentation of the collaborative project provides valuable reference material to all collaborating parties. However, some counter arguments for smaller company operations where flexibility is preferred over a rigid contract have also been voiced in the study. Milestone control is another factor that has a direct impact on the organization's process control. Cooper's [47] stage-gate model explains the importance of regular milestone monitoring at each gate. In fact, the feedback from this empirical study also indicates that milestones can be closely correlated with the company's reward structure to encourage team members in the distributed product development environment. Establishing a good reward system and celebrating milestone achievement help in improving product development efficiency.

Finally, this study confirms that supporting tools are critical factors in helping an organization achieve success in the CPD process. These tools are particularly essential to streamline operations with large and distributed projects and reduce uncertainties. Email, telephone, and Skype are categorized as the most essential communication supporting tools in dealing with people both internally and externally. In particular, when responsibility assigning and response recording are important, tools such as issue tracking system help in these functions. Thomas and Bostrom (2010) stress the use of adaptive technology-mediated tools to allow multiple users to collaborate together and create a knowledge database. It has further been demonstrated that the fast development of these tools has facilitated the interaction between users, and thus has largely assisted the innovation process.

Conclusions and Future Research

A successful CPD is a journey that involves complexities within multiple areas. Four contexts (senior management, team, process, and supporting tools) play a vital role towards creating an effective learning and innovative environment within inter/intra-organizational collaboration. Interactions between factors amongst the different contexts assist the management to define a shared goal, design tools and techniques, and enable cross-functional teams to share competencies in the product development process. Senior management needs to find a balance and consider all of these factors during the product development process to effectively streamline the project activities and achieve better results through collaboration. For example, findings suggest that effective leadership from senior management leads to a healthy trust relationship within the team. Development of COCs differentiating the team's location-focus, builds upon specialized core competency within groups. Selecting the right partner enhances corresponding project capabilities for better results. Similarly, effective communication strongly correlates with having regular team meetings or using supporting tools such as telephone, email, and Skype. This means establishing inter-group relationships within the CSF framework (Figure 1) can help senior management analyze

factors affecting project progress and better address deficiencies in the collaboration effort.

The constraints and risks in collaborative product development require careful strategic planning and good partnership preparation from senior management. Different managerial processes in collaborating firms can influence the project outcomes, thus obtaining a coherent process between the collaborating parties is an essential factor to achieve project success. Knowledge-leveraging processes involving compatible information sharing tools for maintaining data assets such as component library and problem tracking system provide support in establishing concurrent engineering and sharing of knowledge across competency centers. Use of ICT tools such as change request system, version control system, and project scheduler software provide the necessary support and ensure timely completion of projects enhancing visibility across intra-organizational locations.

Finally, the CPD process management experiences gained from the case study has offered information-rich insights on how product development managers and teams plan and execute collaborative projects. The impact of four contexts on the CPD process has revealed practices associated with the CSFs that bring deeper understanding on focused collaboration efforts used in hi-tech firms. The findings from this research are limited by the small sample size of one project and the ten participants interviewed within this case. Therefore, a larger sample of cases for empirical research relating to NZ product development organizations could stimulate future studies. However, the conceptual framework developed in this study may be used in future research and applied to various product development environments in a wider range of industries and communities.

References

1. Li, W.D. and S.K. Ong, Collaborative Product Design and Manufacturing Methodologies and Applications, Springer (London, 2007).
2. Trott, P., Innovation Management and New Product Development, Prentice-Hall (New York, 2008).
3. Bruce, M., F. Leverick, and D. Littler, "Complexities of Collaborative Product Development," *Technovation*, Vol. 15, No. 9 (1995), pp. 535-552.
4. Paasivaara, M. and C. Lassenius, "Collaboration Practices in Global Inter-organizational Software Development Projects," *Software Process Improvement and Practice*, Vol. 8, No. 4 (2004), pp. 183-199.
5. Norbum, D. and R. Schoenberg, "Acquisitions and Joint Ventures: Similar Arrows in the Strategic Quiver," *Proc British Academy of Management Conference*, Glasgow, 1990.
6. Harrigan, K.R., Managing for Joint Venture Success. Lexington Books (MA, 1986).
7. Arenas, A., *et al*, "Bridging the Gap between Legal and Technical Contracts," *Internet Computing, IEEE*, Vol. 12, No. 2 (2008), pp. 13-19.
8. Balachandra, R., "Factors for Successs in R&D Projects and New Product Innovation: A Contextual Framework," I*EEE Transactions on Engineering Management*, Vol. 44, No. 3 (1997), pp. 276-287.
9. Sun, H. and W.C. Wing, "Critical Success Factors for New Product Development in the Hong Kong Toy Industry," *Technovation*, Vol. 25, No. 1 (2005), pp. 293-303.
10. Lam, P. and K. Chin, "Identifying and Prioritizing Critical Success Factors for Conflict Management in Collaborative New Product Development," *Industrial Marketing Management*, Vol. 34, No. 8 (2005), pp. 761-772.
11. Lu, X., L. Huang, and M. Heng, "Critical Success Factors for Inter-organizational Information Systems - A Case Study of Cisco and Xiao Tong in China," *Information and Management*, Vol. 43, No. 3 (2006), pp. 395-408.
12. Burton-Jones, "Minimizing Method Bias Through Programmatic Research," *MIS Quartely*, Vol. 33, No. 3 (2009), pp. 445-471.
13. Ulrich, K.T. and S.D. Eppinger, Product Design and Development, McGraw-Hill (New York, 2004.
14. Cooper, R.G., Winning at New Products, Perseus Books (Cambridge, 2008).
15. Anderson, A.M., "A Framework for NPD Management: Doing the Right Things, Doing them Right, and Measuring the Results," *Trends in Food Science & Technology*, Vol. 19, No. 11 (2008), pp. 553-561.
16. Clark, K.B. and T. Fujimoto, Product Development Performance, Harvard Business School Press (Boston, 1991).
17. Chesbrough, H.W., Open Innovation, Harvard Business School Press (Boston, 2005).
18. Heeks, R., *et al*, "Synching or Sinking: Global Software Outsourcing Relationships," *IEEE Software*, Vol. 18, No. 2 (2001), pp. 54-60.
19. Prandelli, E., M. Sawhney, and G. Verona, Collaborating with Customers to Innovate, Edward Elgar (Bodmin, 2008).
20. Herbsleb, J. and R. Grinter, "Architectures, Coordination, and Distance: Conway's Law and Beyond," *IEEE Software*, Vol. 16, No. 5 (1999), pp. 63-70.
21. Battin, R., *et al*, "Leveraging Resources in Global Software Development," *IEEE Software*, Vol. 18, No. 2 (2001), pp. 70-77.
22. Strawbridge, C., "Project Management in Large Collaborations: SNS Lessons Learned for Iter," Fusion Engineering, *21st IEEE/ NPS Symposium*, 2005, pp. 1-5.
23. Thamhain, H.J., "Managing Technologically Innovative Team Efforts Toward New Product Success," *Journal of Product Innovation Management*, Vol. 7, No. 1 (1990), pp. 5-18.
24. Zirger, B.J. and M.A. Madique, "A Model of New Product Development: An Empirical Test," *Management Science*, Vol. 36, No. 8 (1990), pp. 67-83.
25. Ogbonnia, K.S., Political Party System and Effective Leadership in Nigeria: A Contingency Approach, Walden University Press (US, 2007).
26. Cooper, R.G. and E.J. Kleinschmidt, "Determinants of Tmeliness in Product Development," *Journal of Product Innovation Management*, Vol. 11, No. 5 (1994), pp. 381-396.
27. Cooper, R.G., S. Edgett, and E.J. Kleinschmidt, "Portfolio Management for New Product Development: Results of an

Industry Practices Study," *R&D Management*, Vol. 31, No. 4 (October, 2001), pp. 361-380.
28. Rautiainen, K., M. Nissinen, and C. Lassenius. "Improving Multi-project Management in Two Product Development Organizations," *Proc 33rd Hawaii International Conference on System Sciences*, Hawaii, 2000.
29. Cooper, R.G., S. Edgett, and E.J. Kleinschmidt, Portfolio Management for New Products, Perseus Books (Cambridge, 1998).
30. Belliveau, P., A. Griffin, and S. Somermeyer, The PDMA Toolbook, John Wiley & Sons (New York , 2004).
31. Edward, F., "Investigation of Factors Contributing to the Success of Cross-functional Teams," *Journal of Product Innovation Management*, Vol. 17, No. 3 (2000), pp. 221-235.
32. Kahn, K.B., "Interdepartmental Integration: A Definition with Implications for Product Development Performance," *Journal of Product Innovation Management*, Vol. 14 (1997), pp. 161-178.
33. Avan, R.J. and C.S. Hemant, "Collaboration in Cross-functional Product Innovation teams," *Emerald Group Publishing Limited*, Vol. 12 (2006), pp. 1-25.
34. Song, M.X., J. Xie, and B. Dyer, "Antecedents and Consequences of Marketing Managers: Conflict Handling Behaviours," *Journal of Marketing*, Vol. 64, No. 2 (2000), pp. 50-66.
35. Rowland, J. "Developing a Climate of Trust During New Product Development: A Conceptual Framework," *Proc ANZMAC 2005 Conference: Entrepreneurship, Innovation and New Product Development*, Perth, 2005.
36. Tessarolo, P., "Is Integration Enough for Fast Product Development? An Empirical Investigation of the Contextual Effects of Product Vision," *Product Development & Management Association*, Vol. 24, No. 1 (2007), pp. 69-82.
37. McDonough, E.F., "Investigation of Factors Contributing to the Success of Cross-functional Teams," *Elsevier Science*, Vol. 17, No. 3 (2000), pp. 221-235.
38. Souder, W.E., "Managing Relations Between R&D and Marketing in New Product Development Projects," *Journal of Product Innovation Management*, Vol. 5 (1988), pp. 6-19.
39. Earl, M., "The Risks of Outsourcing IT," *Sloan Management Review*, Vol. 37, No. 3 (Spring, 1996), pp. 26-32.
40. Alexander, M. and D. Young, "Outsourcing: Where's the Value? Long Range Planning," Vol. 29, No. 5 (1996), pp. 728-730.
41. Aubert, B.A., M. Patry, and S. Rivard. "Assessing the Risk of IT Outsourcing," *Proc 31st Hawaii International Conference*, Hawaii, 1998.
42. Farr, C.M. and W.A. Fischer, "Managing International High Technology Co-operative Projects," *R&D Management*, Vol. 22, No. 1 (1992), pp. 55-67.
43. Leornardi, P.M. and D.E. Bailey, "Transformational Technologies and the Creation of New Work Practices: Making Implicit Knowledge Explicit in Task-Base Offshoring," *MIS Quartely*, Vol. 32, No. 2 (2008), pp. 411-436.
44. Thomas, D. and R. Bostrom, "A Trigger Model for Technology Adaptation Interventions," *MIS Quartely*, Vol. 34, No. 1 (2010), pp. 115-142.
45. Hobday, M., "The Project-based Organization: An Ideal Form for Managing Complex Products and Systems," *Science and Technology Policy Research*, Vol. 29, No. 7-8 (2000), pp. 871-893.
46. Patton, M.Q., Qualitative Evaluation and Research Methods, Sage Publications (Thousand Oaks, 2002).
47. Cooper, R.G., "Third-generation New Product Processes," *Journal of Product Innovation Management*, Vol. 11 (1994), pp. 3-14.
48. Hoffmann, W. and R. Schlosser, "Success Factors of Strategic Alliances in Small and Medium-sized Enterprises - An Empirical Survey", *Long Range Planning*, Vol. 34 (2001), pp. 357-381.