Accelerating New Product Development through a Cross-Functional Design for eXcellence approach to Conflict Management

Case Studies in a High Technology Firm.

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Abstract

New Product Development (NPD) has been defined as a strategic activity. For technology-based firms it is even an essential activity for the continuity of their business. The combination of process and often product complexity, combined with stakeholder and interest diversity has been deemed to hold the ingredients for conflict to arise. The main functions of Marketing, Development, Procurement and Operations are likely to be involved in NPD related conflict. Conflict is perceived as a natural part of NPD and arises in mainly two types: process conflict, due to a lack of clarity on processes, roles and responsibilities, and substantive conflict, disagreement on the content. Substantive conflict has been found to have a positive effect on NPD performance and NPD actor relations, while process conflict has a negative effect on both performance and relations. Seemingly process conflict hinders the positive effects of substantive conflict on NPD performance. Developments in the collaboration domain of NPD like cross-functional collaboration and the Design for eXcellence (DfX) methodology have refocussed attention on collaboration, conflict and conflict management. Through a multi-method and multi-actor approach, escalation has been found to be a frequently applied conflict management approach in settings with process conflict. Depending on the chosen approach, an earlier execution of the holistic and cross-functional DfX approach in NPD workshops can be a promising tool and a potential process vehicle for conflict management. By addressing issues upfront with all stakeholders at the table, the approach eliminates process conflict and stimulates substantive conflict instead. Furthermore, it can minimise unidentified risks, delays and mismatches between the developed product and customer expectations, while delivering the right product with the right customer value at the best available costs.

Key Words: New Product Development | Collaboration | Conflict | Conflict Management | DfX

1. Introduction

The survival of businesses in the long run depends on their ability to successfully introduce superior products, services or solutions into the marketplace, often described in the catch-phrase ‘innovate or die’. With approximately one out of every four products achieving market success, a successful business system needs to perform well at delivering a product that satisfies the needs of the customer at which it optimises costs (Leber, Bastic, Mavric, & Ivaniševic, 2014). Technology-based organisations face no other choice than to challenge their current paradigms. They must challenge in order to meet the changing demands in the fast changing environment in which they operate (Leonard-barton, 1992), and to their dependency on technological development. In this process, it is critical that the “old fit be consciously disturbed” (Chakravarthy, 1982) as cited by (Leonard-barton, 1992). The only time for organisations to develop new core resources is when their current ones still work well. For such changes, the new product development process
has been found to be an adequate vehicle (Leonard-barton, 1992).

**Cross-Functional Collaboration**

Traditionally, functions like Marketing, (Research & Development and Operations specialise in specific parts of the planning activities, often resulting in conflicts over expectations, preferences, and priorities (Oliva & Watson, 2011). The implementation of cross-functional teams is used by firms to answer to external pressures to fast product development, global presence and flexible organisation.

**Cross-functional teams** have been defined as: “A group of people with a clear purpose representing a variety of functions or disciplines in the organisation whose combined efforts are necessary for achieving the team's purpose. The team may be permanent or ad hoc, including customers and vendors.” (Parker, 2002). Such teams tend to be increasingly common in fast-changing market organisations which are characterised by the need for adaptability, speed and customer need focus. They are applied in situations which involve complexity, such as new product development (Levi, 2007). Their diversity, functional and possibly organisational, creates both benefits and problems. Benefits result in higher efficiency and effectiveness; efficiency measured in the use of the least amount of time, labour or resources. Effectiveness is measured by a team's ability to complete its task (Levi, 2007). The advantages of cross-functional teams are numerous; speed, early problem identification, better serving the customer through different insights and perspectives, and pooling of expertise from different sources (Parker, 2002). However, cross-functional teams do not fit in any organisation. They require decision-making authority to be able to coordinate change efforts quickly and effectively (Parker, 2002).

It is important to emphasize that effective implementation of cross-functional teams has been found to be critical to the success of new products. There is a catch to it though, as it often occurs that groups choose premature commitment to the first acceptable solution instead of taking a constructed approach to problem solving (Levi, 2007). In production, issues of misalignment were addressed early in the process through the creation of concurrent engineering teams with team members of design and manufacturing (Levi, 2007).

**Conflict**

As most organisations focus on managing individuals rather than managing teams (Levi, 2007), this setting increases conflict sensitivity due to individual evaluation instead of on a team level. The interfaces between functions tend to be the milestone meetings throughout the NPD process during which they meet. During these meeting all elements of the puzzle are required to converge to gradually form the envisioned product, service or solution which the organisation decided to develop and offer on the market place. The uncertain nature of the NPD process being prone to conflict itself does not stimulate the performance of neither the NPD process, nor of the business. Rather, the NPD process should be dealt with in a way that caters for maximum utilisation of the insights, knowledge and experience of the different functions involved in the process.

**Design for eXcellence**

Marketing, (Research & Development, Procurement and Operations are the main functional groups within technology firms that are involved in the initial process of product development (Feng, Jiang, Fan, & Fu, 2010; Gemser & Leenders, 2011; Holland, Gaston, & Gomes, 2000). A more focused collaboration among these multiple functional groups enables better performance through better products, higher margins, and a stronger ability to innovate. Elements that are likely to contribute to extended business continuity (Feng et al., 2010; LaFasto & Larson, 2001; Levi, 2007). By combining deep insights about customers, competitors, and suppliers, firms are enabled to strengthen their organizational capabilities and competitiveness. By taking out costs and increase what their customers truly value throughout the product development phase, firms are enabled to lower costs while designing better products that customers value more. A lack of integration between the stages of
the Product Realisation Process (PRP) has shown to result in an increase in issues regarding manufacturing, installation, maintenance, service, safety, environment, and reliability. Lacking integration comes at the price of additional expenses in production, deployment, redesign, and delays in market-entry (Gatenby & Foo, 1990).

Design for eXcellence (DfX) is a methodology for collaboration and decision-making in NPD that has proven to be effective as a vehicle to overcome functional barriers in cross-functional collaboration and decision-making (Dombrowski, Schmidt, & Schmidtchen, 2014; Gatenby & Foo, 1990; Leber et al., 2014). The methodology is deemed to break down the walls between functions by requiring cross-functional collaboration through its holistic nature. It takes a holistic perspective over a range of different elements, the so-called X’s in ‘Design for X’ taken into scope in the design and development process, include: Manufacturing and Assembly (DFMA), Reliability and Maintainability, Testability, Service, Disassembly, Recycling, Logistics, and Environment (Dombrowski et al., 2014; Gatenby & Foo, 1990; Leber et al., 2014).

DfX consists of four main elements that have deeper levels of granularity; 1) Technical core; 2) Education and Training; 3) Managerial Considerations; and 4) Communication and Teamwork (Gatenby & Foo, 1990). The DfX methodology grew out of the combination of multiple methods for NPD, among which the value methodology Value Analysis (VA). VA, also known as Value Engineering (VE) or Value Methodology (VM), is one of the methods to reaching an optimal point in function, value and costs (Leber et al., 2014). VA addresses non-value adding characteristics in both internal issues arising from insufficient information in NPD decision-making and external issues regarding market changes in pricing, environment, technology and materials (Leber et al., 2014). The difference between VA and DfX lies in VA’s limited scope on concept development and prototyping, whereas the DfX methodology covers the entire product development and maintenance spectrum. The power of the DfX methodology lays in its overarching scope, bringing different functions together in collaboration and decision-making regarding specific aspects related to costs, value, supply and value chain, marketing, and quality. By addressing those elements cross-functionally and questioning the best decisions for both customer value, cost, and quality drivers, time and cost impacting issues are less likely to arise unexpectedly later in the NPD process. Furthermore, by addressing all product aspects with the relevant functions, misunderstandings on product feature, specification and component choices are less likely to occur. The reduction of such impacts is likely to increase the speed of collaboration and decision-making throughout the NPD process, while addressing the market and technology uncertainties from multiple viewpoints.

This paper aims to argue that time efficacy in NPD can be achieved through the application of conflict management through a cross-functional Design for eXcellence approach.

First, the research method is explained in section 2. The concepts of collaboration and conflict are discussed in section 3, followed by the characteristics of collaboration and conflict in the NPD process in section 4. Sequentially, the cross-functional DfX approach is elaborated on in section 5. Section 6 discusses DfX as a conflict management approach. The conclusion is presented in section 7, followed by recommendations for further research in section 8.

2. Method

The research is addressed through the conduct of a multi-method approach consisting of a literature study, semi-structured interviews, and participatory observations of workshops.

The literature study addressed the domains of New Product Development (Cohen & Eliashberg, 1996; Cooper, 1990; Trott, 2008), collaboration (Jassawalla & Sashittal, 1998), teams (Levi, 2007; Parker, 2002), conflict (Amason, Thompson, Hochwarter, & Harrison, 1995; Deutsch, 1990; Jehn, 1997; Rese & Baier, 2005; Shaw, Shaw, & Enke, 2003; Weinrauch & Anderson, 1982), conflict management (Rahim, 2002). This literature
has formed the knowledge foundation on which the research has been initiated.

The empirical research was conducted in a two case study settings in which the five main functions of two NPD teams totalling 23 members were interviewed in approximately 45 minute semi-structured interviews, complemented by 12 additional interviews with NPD actors from other teams and corporate support functions. Project documentation, project learnings documentation, and participative observations of cross-functional DfX and Value Engineering workshops during their NPD project complemented the interview data. Additionally, corporate support function in change management and business transformation and members of other teams within the same company divisions were interviewed in a similar manner to reflect upon the two case studies and gain a thorough understanding of the research content.

3. Collaboration and Conflict

The potential for conflict is present when two or more organisational departments strive for mutually acceptable choices or agreements on issues including product specifications and vendor capabilities (Sheth, 1973) as cited in (Barclay, 1991). It is likely for conflict to occur in settings of collaboration, with collaboration being defined as “The action of working with someone to produce something” (Oxford Dictionary, 2015), and as “a process that occurs when a group of autonomous stakeholders of a problem domain engage in an interactive process, using shared rules, norms, and structures, to act or decide on issues related to that domain” (Gray & Wood, 1991).

Conflict has been defined by (Katz and Kahn, 1978, p. 613) as cited in (Barclay, 1991) as “the collision of actors”. Conflict, seen as task conflict, is defined as non-personal disagreements over work goals, objectives, and methods (Dyer & Song, 1998). The outcomes of conflict can be constructive or destructive, depending on the management of conflict and the required emphasis on the discriminating understanding of its causes (Barclay, 1991). Existing research in organisational behaviour has suggested that interdepartmental conflict is a consequence of several factors. These factors include organisational context, its functioning as a social system, its structure, and the interrelations between its organisational subsystems (Barclay, 1991). Conflict may include the interference with other departments, exaggeration of a department’s need to influence another department or the distortion of information (Walton, Dutton, and Cafferty, 1969) as cited in (Barclay, 1991).

Conflict within organisations occurs in multiple types. Dyadic or interpersonal conflict is characterised by the incompatibility or disagreement of between two or more members of the organisation on the same or different hierarchical levels (Rahim, 2002). Such conflict can occur between members of the same group – defined as intragroup conflict – or between members of different groups or units within the organisation – defined as intergroup or interdepartmental conflict. Roloff (1987) as cited in (Rahim, 2002) argues that; “Organisational conflict occurs when members engage in activities that are incompatible with those of colleagues within their network, members of other collectivities, or unaffiliated individuals who utilise the services or products of the organisation”.

A study by (Zaltman, Duncan and Holbek, 1973, p. 149) as cited in (Barclay, 1991) concluded that “the structural characteristics of innovative organisations have a high potential for intra-organisational conflict.” (Barclay, 1991). Prevention of missing out on trends and their impact on an organisation’s business requires an organisation to take a critical position towards its own choices and activities. Although critical views are often expressed through constructive argumentation and discussion, addressing topics which are sensitive to organisational politics might be perceived as threat to an individual, group or organisation and therefore may result in conflict. In order to cope with such situations between different units or groups, organisations may stimulate and facilitate mutual adjustment between parties (Mintzberg, 1989). The definition of conflict is broadened even further by Rahim (2002). Rahim conceptualised it as an interactive
process that is manifested in incompatibility, disagreement, or dissonance within or between social entities like individuals, groups, or organisations. This study follows this definition of conflict due to its relative neutral and simplistic definition and its articulated relation with interactions.

With the definition clarified, it is important to identify the potential types of conflict that could arise in the context of NPD. Barclay (1991) argues that three types of conflict can be identified: 1) imagined or perceived conflict; 2) latent or substantive conflict, as in differences of interest or opinion, and 3) affective conflict, characterised by great anger or the lack of it (Barclay, 1991). These conflict types are accompanied by process related conflict; conflict caused by ambiguity in roles and responsibilities. Barclay's (1991) typology of conflict is chosen as a foundation for the typology of conflicts in this study of collaboration and conflict management in the context of NPD. Due to the scope of collaboration and conflict management, the imagined and affective conflict types relating only to a personal level are not taken into account in this research. The two conflict types taken into account in this research are therefore: substantive conflict, and process conflict.

A common misconception about conflict is that it is bad. This misconception should be avoided as conflict can also be resolved to the satisfaction of all related to it. Moreover, most organisations tend not to utilise the known functional effects of organisational conflict. A majority of recommendations of regarding conflict is still aimed at the reduction, resolution, or minimisation of conflict on a dyadic or group level (Rahim, 2002). Levi (2007) argues that conflict is a natural part of a team process with either healthy or unhealthy conflict, and that conflict can be beneficial if managed appropriately.

4. Characteristics of Collaboration and Conflict in New Product Development

NPD is defined as a critical strategic activity (Leonard-barton, 1992), and team-based structures with cross-functional teams are relied upon in this domain. However, the early involvement and integration of different functional perspectives carries a contradictory effect. It can increase performance, whilst also being able to deteriorate performance by provoking conflict between and within teams. Intensive inter and intra-team communications are recognised to have positive effects on the NPD process (Pinto & Pinto, 1990, as cited in (Rese & Baier, 2005), although they could be a source of conflict when they relate to divergent points of views, interests, goal orientations, and socio-emotional tensions (Lawrence & Losch, 1967 as cited in (Rese & Baier, 2005).

The NPD process is a place where new ideas, new products, and new processes are created under the dependency of organization members challenging the status quo (Dyer & Song, 1998). Existing research shows that the phase of the NPD process affects the effectiveness and efficiency of cross-functional collaboration. The involvement of multiple functions in NPD has been found to be most effective in the early NPD stages when uncertainty is at its highest level (Song, Thieme, & Xie, 1998). However, this collaboration comes at the cost of often time-consuming consensus building between functions with differing goals and perspectives. A frequent approach to conflict in especially process conflict is escalation to the management team above the NPD team. The escalation approach is chosen when agreements on decisions cannot be reached within the NPD project team. It suggests that project teams struggle with conflicting interests in decision-making, lack decision power or experience risk averse behaviour when it comes to decision-making. The fear of making mistakes by engineers is one of the suggested root causes of frustrations and conflicts in NPD.

It is suggested that a balance between effectiveness and efficiency can be achieved by involving the right mix of functions at function-specific and stage-specific collaboration and decision-making moments in NPD (Song et al., 1998). However, there are more aspects to take into account in the NPD process. Among them are the two crucial elements; creativity and adaptation, which are
created out of tension, passion and conflict (Dyer & Song, 1998). Out of these elements, conflict has a profound impact on NPD performance. The impact can be either positive or negative, depending on the approach to handle conflict, and requires time and attention from managers (Dyer & Song, 1998).

Process conflict tends to occur due to process deviation and uncertainties related to complex products. Dealing with tight project timing and differences in knowledge and perceptions between functions are among the causes of process conflict as well. Other process conflict relates to management priority changes, the role ambiguity of Marketing in NPD projects, and insufficient preparation of the project scope and the required stakeholder involvement. A lack of clarity in the quality of project deliverables at the milestones tends to result in long lead times.

Conflicts experienced by engineers are characterised by process conflict related to communication, and substantive conflict related to defining and meeting quality levels, and addressing information uncertainties in priority setting and decision-making. Other project conflicts relate to resource constraints, tight planning, and late changes to the product.

Substantive conflict during NPD relates to the translation process of Customer Requirement Specifications (CRS) of Marketing to more precise Functional Requirement Specifications (FRS). Other substantive conflict relates to the so-called ‘built-in conflict’ directive that required a ‘handshake agreement’ on the business case to be reached between Marketing and the Markets. This agreement is troublesome because the Markets that request the developed product are approached whilst the product is often still in an immature state. Convincing stakeholders to change towards a market pull approach rather than the organisational habit of a technology push approach is experienced as a substantive conflict as well. At least in this case, the technology driven habit relates to the technical nature of the organisational culture. Furthermore, ongoing organisational changes add to the level of complexity and workload that the organisation needs to handle.

This puts pressure on the development teams and increases the likelihood of priority divergence between team members and the likelihood of conflict as a result.

5. Cross-Functionally applied DfX

This research found a cross-functional application of DfX that was organised in an eight-week convention setting. This setup involved key stakeholders from the main functions; Marketing, Development, Procurement, and Operations in a cross-functional team. The setup fosters collaborative behaviour by actively training, tracking and supporting functions and management in engaging in business performance improving cross-functional collaboration and decision-making. As one of the business partners in new product development, the Procurement organisation within the firm took the initiative and responsibility of piloting and managing the execution of the DfX programme and the tracking process of its total cost of ownership (TCO) financial results within the entire firm.

The application of DfX involved a four phase process with three milestone moments that involve the management team of the business for decision-making.

It starts off with the preparation phase, continues into the idea generation phase. Which is followed by a commitment moment, and finally ending with the implementation of committed plans in order to deliver financial measurable results. The preparation phase is characterised by the gathering process of necessary resources of functional experts, decision-makers, management, tools, and support in facilitation and the scoped content. During the preparation, the involved business partner from a particular function and a small core team of other functions define the scope of the DfX convention. Depending on the needs, known and yet unknown improvement opportunities from the business unit and the available resources, the scope of the DfX project might range from a single component till a complete product portfolio. During the preparation phase, the DfX convention leader and the involved key functional stakeholders define a planning with three key milestone
moments; a Kick-off Meeting start moment, a Mid-Term Meeting evaluation moment, and a Convention Meeting moment during which all the fact validated cost and value improvement ideas are presented to the management team to receive their commitment and resources for the actual implementation of the improvement plans.

During the DfX convention phases, several value and cost analysis tools are made available. The power of these tools lays in the designed-in necessity of creating a cross-functional team for the generation of value and cost improvement ideas of product, services, and solutions. After the kick-off meeting, the DfX process continues with the involvement of cross-functional participants in idea generation workshops with the aim to add value to products and services and cut additional costs and waste out. This is done through a process of creating fact-based information from all involved functions. Followed by challenging ideas and current practices through constructive questioning and debating, and improved decision-making through direct management sponsorship, support, and involvement.

During the DfX workshops, one or more value or cost analysis tools are applied in a cross-functional setting. The cross-functional nature of this setup which combines different points of view and interests is likely to lead to conflict. The DfX toolbox included several so-called work streams; Design, Cost/Spend, Marketing, Value Chain, and Quality. By analysing the systems, components, supply chain, and failure rate of products, services and solutions with the guidance of the analysis tools in a cross-functional team, value and cost effectiveness improvement ideas are generated. This idea generation phase is considered to be the divergence phase in which the scope is widened as much as possible to gain insights and ideas that could result in customer value creation or cost reduction of the analysed product(s). Once ideas are generated during workshops, a majority tends to be in an initially premature phase. The most promising generated ideas are selected by the cross-functional team to be further investigated on feasibility, customer value, investment and cost impact. Due to the broad scope of diverging idea generation and the often premature status of suggestions, this phase tends to be less conflict sensitive than the sequential phase of idea investigation and selection. Due to the likelihood of functional interests and personal preferences colliding during idea converging oriented discussions, this phase has relatively higher conflict occurrences compared to the rest of the NPD process.

6. DfX as Conflict Management Tool

Conflict has been found to mainly occur on the translation of customer requirement specifications to technical requirement specifications at the interface between Marketing and Development. Process deviations, a lack of clarity in the quality of project severable, and uncertainties that are related to the complexity of the products being developed add up to the causes of conflict. Specifically, conflict tends to occur between the key functions of Marketing, Development, Procurement, Operations, and the NPD Integral Project Leads. Insufficient preparation and execution of project elements like scope definition and stakeholder involvement have been found to result in late entry of stakeholders into the process, indecisiveness and ongoing discussions. These discussions have been found to continue due to changes in either the stakeholder field or the commercial or technical specifications. This research suggests consequent to the research findings that conflict management requires elements that address product development content, elements that provide managerial commitment and support, and a clear process. These elements show great similarity to the cross-functional approach of the DfX methodology and its four stage process.

The four main elements of DfX; 1) Technical core; 2) Education and Training; 3) Managerial Considerations; and 4) Communication and Teamwork address the content of NPD. The content is addressed through the technical core elements, capability building through education and training, commitment and support for initiatives through the element of managerial considerations. Furthermore, collaboration is addressed by communication and teamwork. The
process clarifies tasks, roles and responsibilities, and thereby mitigating the risk of process conflict. The implication of clearly defined processes, milestones, milestone deliverables, roles and responsibilities, and experienced project team members with a technical educational background were found to be positive on both the time dimension as well as the relations of NPD actors during the process. Lower levels of the aforementioned elements showed negative effects on the time dimension of the NPD project and increased tensions between the actors.

As this research has shown, process conflict tends to hinder the level of substantive conflict. This is the type of conflict that improves NPD and business performance when it arises in a cross-functional setting. In line with that, a majority of the data argues that the misconception about conflict which has been presented in literature applies in the research context too. Most cases of substantive conflict, problems and misunderstandings are resolved through collaboration and compromise. Only a minority of the results reflect a positive perception of conflict and a clear articulation of the importance of substantive conflict to collaboration and decision-making in NPD, and overall business performance.

Despite these findings, clearly articulated cases of conflict avoidance have been found in cases of process conflict which often occurred at project milestones in one case study. In these cases, conflicts are avoided by ignoring identified and articulated project risks and consequently endangering the projects planning, budget and potentially the product’s quality.

The DfX process addresses such situations through its cross-functional setting with tight management involvement. By providing clarity upfront on the raised risks of ignoring risks, it pushes towards early resolving problems and early questioning of NPD content. Following the empirical research findings, substantive conflict needs to occur early in the NPD process to minimise the risk of negative impacts on time, cost or customer value of the product that is being developed. Through its structured approach on both content and the process along with management commitment, DfX seems to tackle the identified frequently applied conflict management approach of escalation in cases with process conflict. DfX urges NPD teams to take decisions within the team after consulting all the involved functions and content experts, and present those decisions to their management team. During an interview, a development engineer stated that conflict leads to lower team morale, especially when conflict causes delays. This is an element that has not been mentioned by others but can be derived from their statements towards other functions they collaborate with. By addressing all risks early in the process through the cross-functional setting facilitated by the DfX methodology, delays, costs related to them, and decreases in team morale can be tackled effectively. This can be achieved while delivering the right product to the right customer at the right time for the right price, and the best costs for the organisation.

7. Conclusion & Discussion

Conflict has been argued to be natural phenomenon in New Product Development (NPD) and a natural part of the team process. Misconceptions of conflict being bad give it a negative image. Fortunately, research findings have found a trend towards a tipping point towards a positive image of conflict in NPD. This trend is driven by initiatives that influence the way conflict is perceived and experienced. The main initiatives are cross-functional collaboration and the Design for eXcellence (DfX) methodology. Both initiatives require a cross-functional approach. DfX adds to the collaboration setup with NPD content analysis, and management considerations that support both the process and the NPD team in decision-making. By applying the DfX methodology through cross-functional workshops earlier in the NPD process, the negatively impact of process conflict on morale and time can be eliminated earlier in the process. Subsequently, room is created for valuable and performance enhancing substantive conflict. This room is created through the cross-functional setting that urges sharing of different insights and confronting statements and decisions to verify that all the
options have been evaluated and the best one is chosen in relation to the available information and resources. A point of discussion raised by NPD actors is the notion that cross-functional collaboration is time consuming due to the process of sharing of functional expertise. Although these worries are legitimate, it caters for the education and learning element of the DfX methodology, improves mutual understanding among the functions of Marketing, Development, Procurement, and Operations. Furthermore, it increases the occurrence of substantive conflict on the NPD content.

8. Recommendations for further Research

Having addressed the topic of collaboration and conflict management, the main contribution of this research was the identification of escalation as a frequent conflict management approach for both process and substantive conflict in a context with higher levels of process conflict. However, further research is required to identify relations between elements that were left out due to the limitations of this research in time and scope. The concepts of collaboration and decision-making play a central role in conflict management with collaboration and compromise as the main conflict management approaches applied in the studied organisation. However, these concepts have not been addressed extensively in this research. Recommendations for further research are: a study of the relations of collaboration styles on NPD time performance and the relations between NPD actors, and a similar study of the relations of decision-making styles on NPD time performance and the relations between NPD actors. Regarding the DfX methodology, future research is recommended on the usage and effectiveness of the four elements the methodology on NPD time performance.

Further recommendations include the study of the influence of the number of involved stakeholders on the outcome of the process. This recommendation follows several statements by NPD actors about too large teams and too complex stakeholder fields in NPD. The research did also not cover the causes and root causes of much of the identified and articulated conflicts. Furthermore, the effects and implications of conflict management training on NPD performance and collaborative behaviour have not been addressed. As well as the effects and implications of granting project teams more decision-power on NPD performance and collaborative behaviour. Regarding the level of innovation and the level of uncertainties related to it, research on the effects and implications of process flexibility for ‘new to the world’ innovation projects on NPD performance and collaborative behaviour could generate valuable insights on improving the NPD process and conflict. Another often mentioned improvement suggestion for NPD is common Key Performance Indicators (KPIs) among the NPD functions. This research did not address the effects and implications of shared functional requirements and challenges on NPD performance and collaborative behaviour. Such requirements could affect several causes of conflict if relations were to be found and made operational. These research limitations are among the recommendation for further research in this domain. However, the main recommendations for further research following this research are: 1) studying the operational applicability of the Design for eXcellence (DfX) approach in NPD as conflict management vehicle; and 2) investigating the factors that are leading in integrating cross-functional initiatives into the regular way of working

9. References


