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Taking Stock and Looking Ahead: An Introduction to the Special Issue on New Product Development Teams

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It is my great pleasure to introduce this special issue on New Product Development (NPD) Teams. Last twenty five years have witnessed an explosion of managerial and academic interest in product development teams. Recent studies show that between 70 and 97 percent of firms use some form of teams in their NPD activities (Cooper and Kleinschmidt 1994; Griffin 1997; McDonough 2000); with nearly a third of the firms exclusively using teams for new product development (McDonough 2000).

Not surprisingly, there has been a corresponding increase in academic research on NPD teams as well. A cursory search on the Business Source Premier database finds 293 scholarly and peer-reviewed articles on product development teams published over the last twenty five years. The inclusion of managerially oriented articles in trade journals would place this number even higher. The *Journal of Product Innovation Management* has been a significant contributor to this substantial and growing body of knowledge.

However, as with any knowledge base, a review of the literature on NPD teams reveals over- and under-researched areas. The purpose of this special issue was to seek articles that explored leading-edge issues which have received less attention than merited. Submissions that provided unique perspectives through diverse methodological approaches, or interdisciplinary/international/industry-academic collaborations were especially encouraged. I am happy to report that many of these objectives were met. This special issue features papers that contribute theoretically, methodologically, and substantively to enhancing our understanding of new product development teams.

Articles in this special issue address a wide variety of issues ranging from:

- Why are cross-functional NPD teams necessary?
- What are the biggest challenges to such teams? How can these challenges be addressed?
- What kind of information and communication technologies do virtual NPD teams use? How does the nature of the task affect this usage?
- How do socialization mechanisms effect knowledge sharing within inter-organizational NPD teams?
- How do team members' perceptions of fairness in their interactions with the project manager affect the performance on NPD teams?
- How do the characteristics of the team leader affect the internal dynamics of NPD teams?
- Is there a tradeoff between the quality orientation and innovativeness of an NPD team? What role does team autonomy play in this process?

In this introduction to the special issue, I summarize and overview the contributions of the articles. In addition, I offer some thoughts about future research on NPD teams. However, first and foremost I would like to acknowledge the important role of the reviewers of this special issue. The value-added by a special issue is only as good as the contributions of the manuscripts it receives, and the quality of the feedback provided by its reviewers. The reviewers of this special issue not only reviewed multiple rounds of some manuscripts, but in some cases reviewed multiple manuscripts, and gave timely and insightful feedback. I am enormously grateful to the reviewers whose names appear in the listing of special issue reviewers. I

would also like to thank Tony Di Benedetto, the editor of *The Journal of Product Innovation Management*, for allowing me this opportunity to highlight an important stream of research in new product development.

Key Insights and Contributions from the Special Issue Articles

This special issue consists of five competitive papers and an invited commentary. In their opening commentary Edmondson and Nembhard review a broad and heterogeneous body of research on teams and team learning, and synthesize it to offer insights for NPD teams. Readers may recognize Amy Edmondson as one of the most prolific and influential scholars on team learning. Edmondson and Nembhard suggest that increasing use of cross-functional teams in new product development is primarily due to two trends: rapidly evolving knowledge and expertise in functional areas, and shorter product life cycles reducing the lead time for getting new products to market. They posit that cross-functional NPD teams allow organizations to respond effectively to these trends.

Edmondson and Nembhard note that while the use of teams in NPD has been credited with numerous improvements such as reduced development time and cost, better product quality, integration of functional expertise, and utilization of distributed (and often latent) knowledge in organizations; the realization of such benefits has been mixed. They identify five challenges to effective teamwork in new product development:

- complexity of team projects
- communications across functional barriers
- temporary nature of team membership
- fluid team boundaries (including geographic dispersion)
- embeddedness in non-conducive organizational structures

Effective management of these challenges results in team-level benefits in the form of new capabilities and team member skills. Edmondson and Nembhard argue that leadership at the team and organizational levels, psychological safety to encourage interpersonal risk taking, and training/facilitation in communication and conflict resolution are critical to successfully negotiating these challenges. This not only helps develop the project management and teaming skills of the team members, but also gives the team members a broader perspective than one accorded by their functional background alone. Furthermore, effectively managed NPD teams not only provide access to expanded social networks, but also proactively engage in boundary spanning by targeting key organizational actors for support and resources. The commentary concludes by outlining directions for future research including addressing methodological issues some of which are discussed later in this introduction.

The excellent opening commentary also provides a useful framework for integrating the other articles in this special issue. Edmondson and Nembhard note that communication and collaboration across functional boundaries present some of the biggest challenges to the effectiveness of NPD teams; and that these challenges are likely to be even more magnified in distributed teams. In the second paper, Weiss et al addresses this challenge by adopting two different, but complementary, theoretical perspectives offered by the media capacity theories and the social dynamic media theories to explore the use of information and communication technologies (ICTs) by virtual NPD teams. Increasingly NPD teams are working across the constraints of time, space, and organizational boundaries. However, few empirically validated insights are available into the behaviors that enable effective communication and collaboration in such virtual NPD teams.

Weiss et al contend that virtual NPD teams communicate, coordinate and build relationships primarily through the use of ICTs. These teams engage in four kinds of tasks: conveyance (i.e., information exchange), convergence (i.e., decision-making), project management (i.e., scheduling/process), and social (i.e., interpersonal relationships). To conduct these tasks, virtual NPD teams have ICTs that primarily allow for two kinds of interactions: synchronous (i.e., same time, different place) and asynchronous (i.e., different time, different place).

A cluster analysis of data from 181 team members of 15 virtual NPD teams suggests that ICT use in virtual teams depends up a complex interplay of the task type, organizational context, and media type. There does not seem to be one “right” approach to enabling virtual NPD team work. Instead, members of virtual NPD teams tend to display different patterns of ICT use depending upon task and situational characteristics. Weiss et al findings underscore the importance of synchronous communications for convergence and social tasks. They recommend that virtual NPD teams establish standards for availability and acknowledgement of communications. Such teams should be encouraged to agree to a plan of ICT use, with the senders taking responsibility for prioritizing the communications.

In addition to virtual teams, collaborative efforts between organizations represent another growing trend in new product development. No doubt such inter-organizational efforts add another layer of complexity to the collaboration and communication challenges identified by Edmonson and Nembhard. However, despite their increasing importance, research on inter-organizational NPD teams remains disappointingly sparse. Little is known about processes and mechanisms that facilitate knowledge creation and sharing in inter-organizational NPD teams.

The third paper by Lawson et al make an important contribution by offering a rare empirical insight into the effect of formal and informal socialization mechanisms on knowledge sharing in inter-organizational NPD teams. Socialization mechanisms have largely been overlooked as an antecedent in the context of knowledge sharing in inter-organizational NPD. Lawson et al examine buyer-supplier collaborations in 111 NPD projects in the manufacturing sector in UK. Their findings suggest that informal socialization mechanisms (e.g., social events) are positively related to inter-organizational knowledge sharing. While formal socialization mechanisms (e.g., formal project structure, matrix style reporting) were not found to have a direct impact on knowledge sharing, they exerted an indirect positive effect mediated through increased informal socialization mechanisms. Knowledge sharing in these buyer-supplier collaborative teams led to greater development outcomes for the suppliers, and greater NPD (and financial) performance for the buyers.

These findings suggest that knowledge sharing in inter-organizational NPD teams is not something that can be mandated through formal mechanisms. Rather, it has to be brought about more subtly through informal socialization mechanisms, by cultivating trust, sharing experiences and understandings. Lawson et al note that their findings may have implications beyond inter-organizational NPD teams. For example, consistent with Weiss et al’s emphasis on the use of synchronous ICTs for social and relational tasks; Lawson et al suggest that managers/leaders of virtual NPD may want to pay closer attention to real time, informal socialization mechanisms to promote knowledge sharing among their teams.

Edmonson and Nembhard identify leadership as a critical variable for overcoming the challenges faced by NPD teams. Consequently, the next two papers in the special issue deal with team leadership. First, Qiu et al examine the effect of interactional fairness on the performance of cross-functional NPD teams. While distributive and procedural fairness in NPD teams have received some attention in the literature (e.g., Sarin and Mahajan 2001), issues related to interactional fairness have largely been overlooked. Qiu et al explore how the team members’ perception of the fairness of the interpersonal treatment received from project managers/team leaders affects the commitment and performance of cross-functional NPD teams.

Based on data from two samples, Qiu et al first study the phenomenon on 50 teams consisting of undergraduate engineering and business students working on industry projects. Their findings suggest that perceptions of interactional fairness have a positive direct effect on NPD team performance. In addition, interactional fairness has a positive effect on the team members’ commitment to the project, the team, and to each other. Such multi-focused commitment in turn has a positive effect on the performance of cross-functional NPD teams. The authors then cross-validate their findings on a second sample of 226 Executive MBA students in 46 teams working on simulations of new product development projects. Since the EMBA students closely resemble a field sample, the second sample establishes the external validity of these findings.

Qiu et al argue that their findings on interactional fairness suggest that effective project managers need to be sensitive to interpersonal issues and serve as a facilitator. Project managers who treat team members with trust and courtesy inspire them to go beyond the pre-specified job responsibility, creating a climate that promotes integration and information sharing. Following a similar line of reasoning the paper by Sarin and O'Connor ties-in four critical issues highlighted by Edmondson and Nembhard: communication, collaboration, conflict resolution, and leadership in NPD teams.

Drawing upon the path-goal theory of leadership, Sarin and O'Connor examine how team leader's behavior affects the internal dynamics of cross-functional NPD teams. While this topic has received some attention in the NPD literature in the past, the previous research was constrained by a number of theoretical and methodological limitations. Sarin and O'Connor extend this literature by simultaneously examining multiple dimensions of team communication and conflict resolution behaviors (along with collaboration), while controlling for a variety of team and project characteristics which have the potential for confounding the results.

Based on data from 246 members of 64 cross-functional NPD teams, Sarin and O'Connor find that involving team members in decision-making (i.e., participation), and setting goals and expectations (i.e., goal structure) by the team leader exert the most significant and ubiquitous influence on the internal dynamics of NPD teams. In contrast to previous research, interpersonal characteristics like friendliness (i.e., consideration), structuring activities and behaviors of the team members (i.e., process structure), or even the team leader's position do not have a significant effect on the NPD team's internal dynamics. These findings suggest that the team leaders have to walk a tight rope in terms of motivating the team members by setting super-ordinate goals and expectations, but then trusting them to figure out the best way to achieve these goals.

While at first glance Sarin and O'Connor may seem to contradict the findings of Qiu et al, a closer examination would suggest otherwise. Taken together, these two studies indicate that a distinction may need to be drawn between task-related interactional fairness (e.g., participation) and non-task related interactional fairness (e.g., consideration). Sarin and O'Connor's findings would suggest that task-related interactional fairness is likely to exert a greater influence on multi-focused commitment and performance, than non-task related interactional fairness.

The last paper in this special issue by Sethi and Sethi addresses the supposed quality-innovativeness tradeoff in NPD teams. While NPD teams have been credited with improvements in product quality (Edmondson and Nembhard), it has long been argued that the increased emphasis on predictability and low variance from a quality orientation comes at the expense of innovativeness in NPD. Drawing upon the exploitation versus exploration literature in NPD, Sethi and Sethi examine how the quality orientation of a firm, and encouragement to the team to take risks affects the innovativeness of NPD teams in terms of product novelty (i.e., newness) and appropriateness (i.e., relevance). They further examine how the team's autonomy, moderates the relationship between quality orientation and encouragement to take risks, and novelty.

Consistent with Edmondson and Nembhard's argument in support of psychological safety, Sethi and Sethi's analysis of 141 NPD teams finds that encouragement to take risks has a positive effect on product novelty; furthermore, this relationship is strengthened by team autonomy. Surprisingly, a quality orientation was not found to have any effect on product novelty; on the contrary, it improved product appropriateness. On the other hand, encouragement to take risk had a negative effect on product appropriateness, although a quality orientation was able to mitigate this effect. Both novelty and appropriateness were positively related to NPD performance, and mediated the effects of quality orientation and encouragement to take risks on NPD performance. Sethi and Sethi's findings refute the argument that a quality orientation adversely affects innovativeness. On the contrary, their study advances the premise that cross-functional NPD teams can serve as ambidextrous or dual organizational forms that allow firms to increase innovativeness, while maintaining a quality orientation.

Thoughts on Future Research on New Product Development Teams

Need for Greater Attention to Under-Researched Topics and Emerging Issues

While a significant body of knowledge on NPD teams has emerged over the last twenty-five years, much of this attention has been focused on a relatively narrow set of issues. Many topics of academic and managerial significance remain under-explored. For example, Leifer et al (2000) suggest that NPD teams engaged in developing radical innovations (or product platforms) behave differently, and face significantly different challenges than those faced by more conventional NPD teams. Yet, factors contributing to the success of radical NPD teams have not been systematically explored. Similarly, research (e.g. Eisenhardt and Tabrizi 1995) indicates that new product development under compressed time-frames displays unique structure and patterns; suggesting that teams developing products under fast cycle times are likely to face unique challenges, requiring distinctive solutions. However our understanding of the structure, processes and dynamics of effective fast cycle NPD teams remains sparse.

In recent years, interest has evolved in other issues related to NPD teams which remain largely under-explored. NPD teams' external interactions with various organizational constituencies and stakeholders (i.e., boundary management) have been shown to affect their performance (e.g., Ancona and Caldwell 1992). However, little work has been done to follow-up on this line of research. For example, little is known about the antecedents of these boundary management activities, or their effect on internal dynamics or learning in NPD teams. Similarly, Sarin and Mahajan (2001) focused on issues of distributive and procedural justice in NPD teams by demonstrating the effect of reward and evaluation structures on team performance. While Qiu et al extend this dialogue to interactional justice, much more work remains to be done.

As alluded to by Edmondson and Nembhard, interplay between non-conducive organizational structures and processes and NPD teams provide yet another fruitful area for future exploration. The paper by Sethi and Sethi addresses one such issue, the trade-off between a quality orientation and innovativeness. Additional research is warranted on other critical issues such as: the effect of multiple/split NPD team assignments; cross-functional role conflict; and the disconnect between cross-functional and team-based NPD work, and the individually- and functionally-oriented organizational reward and evaluation structures (Edmondson and Nembhard). Moreover, emerging trends in the industry point towards increasing inter-organizational alliances, use of information technology, and dispersed new product development. While some of the papers in this special issue by, (e.g., Weiss et al - virtual NPD teams; Lawson et al - inter-organizational NPD teams) contribute to our understanding of these complex issues, we have barely begun to scratch the surface.

Need to Build on and Extend the Group Dynamics Literature and Theories from Other Disciplines

Research on NPD teams needs to move beyond simply applying existing concepts and theories from group dynamics, management, marketing, and psychology to the new product development context. Indeed, research on NPD teams cannot gain legitimacy as a distinct stream of research by merely using "new product development" as a context for applying theories from other disciplines. NPD team researchers can add significant value by adapting and extending existing theories through the incorporation of unique characteristics and issues specific to new product development. This can be achieved by proposing new paradigms for research, by introducing variables specific to the NPD context, and by identifying boundary conditions and limitations of existing theories.

For example, Ancona and Caldwell (1992) adopted a grounded theory and multi-method approach to document the phenomenon of boundary management by NPD team. Similarly Sarin and Mahajan (2001) were among the first to offer an empirical examination of the effect of team rewards on multiple dimensions of performance specific to new product development. In this special issue the studies by Lawson et al, and Sethi and Sethi serve as good examples of such an approach. While all these authors borrow from the group dynamics literature, they address issues specific to the new product development

using variables unique to the NPD context. The under-researched and emerging issues mentioned earlier also provide a few such areas where additional opportunities might exist for further exploration. The need for insightful conceptual and empirical work on NPD teams cannot be over-emphasized.

Need for Multi-Level Theory Development and Testing

Over the years, research on NPD teams has generally evolved around two distinct levels of analyses: the individual team members, and the team. By and large, individual level research has focused on behavioral issues, while the team-level studies have focused on structures and processes. House, Rousseau and Thomas-Hunt (1995) contend that focus on a purely behavioral or structural perspective can often lead to mis-specified theories. They stress the need to develop cross-level, or “Meso,” theories that address two or more levels of analyses, combining both structural and behavioral variables (House, Rousseau and Thomas-Hunt 1995). This issue needs to be highlighted in the interest of richer theory development in the context of NPD teams.

Research on NPD teams needs to pay greater attention to:

- building models that incorporate the inter-relationships between behaviors, structures and processes associated with NPD teams
- measuring variables at the appropriate levels of analysis (i.e., individual, team, and organizational).
- proposing cross-level models and theories, and then testing them using multi-level analyses.

Edmondson and Nembhard note that while attempts have been made in the in the past to construct cross-level or multi-level models of NPD teams, the testing of such models has often failed to acknowledge, address, or otherwise control for the nested nature of team related data. In nested data such as those found in NPD teams, lower level units (i.e., individuals) reside within higher level units (i.e., teams), which can reside within yet higher level units (i.e., organizations). Therefore it is highly recommended that future research on NPD teams explore methodologies such as Within And Between Analysis (WABA) and Hierarchical Linear Modeling (HLM) that are particularly well suited for analyzing such nested data (Edmondson and Nembhard). Despite their obvious advantages, the use of such multi-level analyses in the study of NPD teams remains non-existent (see Sarin and McDermott 2003 for an exception). However, in this issue both Qiu et al, and Sarin and O’Connor present a significant methodological improvement over past research on NPD teams by employing hierarchical linear models (HLM) in their data analysis.

Researchers conducting studies on NPD teams are often confronted with many recurring methodological issues: should the data be collected from key informants, or multiple members of the NPD team? While data collection from key informants is easier, it raised issues representativeness, especially if the NPD teams are cross-functional in nature. Collecting data from multiple respondents in the teams raises a different set of challenges: How should the data be analyzed? Should it be analyzed at the individual level or at the team level? Analyzing the data at the individual level overlooks the fact that due multiple respondents from each team there are interdependencies among the observations. Whereas, averaging/aggregating individual responses to create a team level response loses substantial variance in the data, and leads to questions regarding the degree of convergence/divergence of responses with the teams. Use of methodologies like HLM allows researchers to capture the richness of both team-level and individual-level variance in the data, and leads to a more robust multi-level test of proposed theories and models.

Conclusion

The set of papers in this special issue contributes insights to new product development teams, progressing towards our collective goal of stimulating rigorous theoretical, methodological, and substantive research in this arena. I hope you find the set of papers useful and invigorating to your own research and thinking.

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