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Time Bound Formalization and its Role in Building Team Flexibility in Product Development Organizations

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Abstract

In this paper, we explore the nature of a new factor named 'Time-Bound Formalization' (TBF) in building flexibility into Product Development (PD) teams. This new factor was derived from the study of 108 PD teams in public and private sector. Conceptually, TBF appears to be a subset of Formalization, with a focus on procedures that are associated with a time-bound. We observed that TBF plays a vital role in facilitating Team Flexibility. In case of large teams, it helps in balancing Team Flexibility and Team Performance. A deeper understanding of TBF can provide clues for formulating better PD practices to promote Team Flexibility.

Keywords: Flexibility, Formalization, Product Development, Teams, Team Flexibility, Time Bound Formalization, Team Performance

Introduction

It is quite overwhelming to find that research work related to flexibility has a history of more than 100 years. The concept of flexibility achieved prominence during the 19th century after the invasion of Japanese car makers into US auto market. The invasion forced US auto industry to switch from the rigid system of 'Mass Production' to a system capable of dealing with dynamic market conditions. Parallely, there was also a transition in the management philosophy followed by these organizations-from classical principles of stability and control to modern principles of embracing change and uncertainty. Thus, building the ability to cope with the challenges of dynamic environment (i.e. flexibility) became an important consideration (Pine & Davis, 1999).

Flexibility can be implemented at various levels of organization- at the individual level, group level or the organization level itself- depending upon context and the requirements. In this study, we deal with building flexibility at team level (i.e. Team Flexibility) in the context of PD. Specifically, we intend to focus on the factors that help to build Team Flexibility. The study discusses about a new factor named 'Time-Bound Formalization (TBF)' and its impact on Team Flexibility and Team Performance. This new factor was derived as a part of major study that was carried out on 108 PD teams from public and private sector. We start-off by providing a brief background about flexibility followed by a discussion on the role of Formalization in building Team Flexibility. Finally, we discuss about TBF and how it influences Team Performance.

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Flexibility

The word flexible is intuitively understood as '*being adaptable*'. However, the difficulty arises when we attempt to provide a concrete and comprehensive definition of flexibility. Researchers have always found it to be a 'hard-to-capture' construct because of its polymorphous and multidimensional nature (Sethi & Sethi, 1990). Despite the difficulties, we can observe a common theme surrounding various definitions of flexibility i.e. its association with change and uncertainty (Evans, 1991; Golden & Powell, 2000; Sethi & Sethi, 1990; Volberda, 1999). So in a broad manner, Flexibility can be considered as the '*ability of an entity to deal with change and uncertainty*'. Further, the entities, type of change and type of uncertainty can vary from one context to another. In this study, the entities are the PD teams, and consequentially we term the flexibility associated with these teams as PD Team Flexibility.

PD Team Flexibility

Product Development is a process of transforming an idea to a product (Ulrich & Eppinger, 2004). It consists of sequence of steps ranging from identification of market opportunity to production and sale and delivery of the product (Ulrich & Eppinger, 2004). To conduct the PD activity, organizations most popularly use cross-functional (or multi-functional) team amongst the many organizational forms (Griffin, 1997). These cross-functional teams are formed with personnel from different functional departments to support the design, development and production of a new product. These teams usually enjoy greater autonomy in deciding the course of PD (Smith, 2007). The importance of using cross-functional teams is widely acknowledged with many research studies highlighting the critical role played by them in achieving product success (Ernst, 2002; Smith, 2007). Since PD teams are at the centre of the development activity, making these teams flexible and responsive to changing market conditions would help the PD organizations to operate in a dynamic environment. Such a capability will provide organizations with a competitive edge to achieve success. According to McComb *et al.* (2007), cross-functional teams have the "*potential to exhibit highest level of flexibility*". To make use of this potential, we first have to understand what PD Team Flexibility is and how a team derives its flexibility.

Li *et al.* (2010) explains how a team derives its flexibility using the concept of dynamic capability and Resource based view (RBV) perspective. According to them, the competitive edge (in our case flexibility), is derived out of the capabilities of the heterogeneously distributed resources. These capabilities are the mechanisms with which entities (teams or organizations) achieve new resource configurations to deal with the emergence of situations as "*markets emerge, collide, split, evolve and die*" (Li *et al.*, 2010). Thus, by extending the logic of RBV perspective to the PD teams, we can now consider PD teams as a collection of entities (resources). These entities, both individually and together, provide teams with the required capabilities to become flexible. Based on the above conceptualization, we can define PD Team Flexibility as the '*ability of a PD team to deal with changes and uncertainties that may arise during the course of PD by means of appropriate resources*'. The resources commonly include people, structure, process and technology. These resources and their interactions are graphically depicted in the figure 1. Also, it can be inferred that each of these resources have their own flexibility enabling potential. Of the many resources, structural mechanisms represent an important resource which can enable the team to achieve higher levels of flexibility. Formalization is one such structural mechanism.

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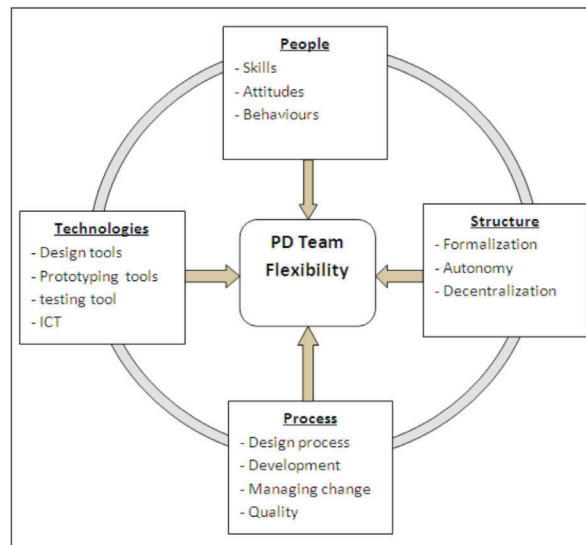


Figure 1: PD Team Flexibility from a RBV Perspective

Formalization and its Impact on Flexibility

Formalization refers to the “degree of work standardization and the amount of deviation that is allowed in the standards” (Aiken & Hage, 1966). It is one of the structural characteristics of the organization. An organization having a high degree of formalization would be highly predisposed to governance by rules and procedures. According to Aiken and Hage (1966), formalization at a task level can be achieved by task standardization i.e. by prescribing who, when and how the tasks are to be executed. Formalization techniques standardize employees’ behaviour and reduce variability in their output. A greater degree of standardization (i.e. formalization) “not only eliminates the possibility of employees engaging in alternate behaviours, but it even removes the need for employees to consider alternatives” (Aiken & Hage,1966). This strategy is arguably more suitable for tasks that can be codified i.e. routine and repetitive. For tasks like PD, teams regularly come across unique situations and hence a high degree of formalization might prove to be drawback in responding to changes (Langfred and Moye, 2004).

According to Tatikonda and Rosenthal (2000), Formality (i.e. formalization) in PD refers to use of structured processes for managing the project. These structured processes include rules, procedures, periodic reviews for project control and execution. The phase-gate system currently employed by majority of the PD organizations is a classic example of a structured process. A point to note here is the degree of formalization can vary from being highly formal (highly structured) to informal (ad-hoc) . A formal process can contribute towards improving the overall team effectiveness by reducing ambiguity and help in quicker resolution of potential problems. However, excessive formality can impair flexibility. Excess formality means more time is spent on reviews and procedures, rather than the “real” work. Further, these rules and procedures would force the teams in a pre-determined direction taking away the adaptability that is needed for solving problems that may arise during the course of PD (Tatikonda & Rosenthal,2000).

Time-bound Formalization

Time Bound Formalization (TBF) refers to the usage of structured practices which are bound by strict time limits for control and management of PD activity. In the context of PD , the structural

practices include rules, procedures and review techniques adopted during the different phases of PD. TBF represents those formalization practices that have a time factor associated with it. The mode of specifying this time factor can vary - it can be expressed in terms of a fraction of the total project duration or can specified as a ratio w.r.t to a given standard or in any appropriate manner.

To illustrate the difference between TBF and formalization, we consider a hypothetical example of defining a strict review practice for monitoring the progress of the PD activity. Normally, implementing a high degree of formalization (i.e standardization) for such a review practice would imply specifying who, when and how the review should be performed. To categorise a practice under TBF, the presence of time-factor alone is sufficient; the details such as review parameters and who does review are optional. In the hypothetical example, if the review practice requires that the time between two successive stage –gate reviews should be less than 1/3 rd of the total project duration, then such a practice can be categorised under TBF. Likewise, many practices can be brought under the ambit of TBF by associating them with a time factor.

Based on the above example, we can argue that conceptually TBF is a subset of formalization. TBF lays more emphasis on time aspect of work standardization. Since the time element of work standardization is already well defined in TBF procedures, the degree of formalization one can achieve in a given time frame gets automatically defined. In fact, TBF can be considered as one of the means of implementing a low degree of formalization. In light of our findings in the literature about a low degree of formalization facilitating flexibility (Langfred and Moye, 2004), we can infer that TBF helps teams to achieve higher flexibility. While a high degree of TBF would eventually mean a well timed PD plan, lower or moderate levels of TBF would indicate time constraints only on limited activities. Implementing TBF practices indirectly results in imposing boundary conditions on certain critical activities during PD and these imposed conditions can translate into either narrowing or broadening the horizon of flexibility. Because of its potential influence on PD Team Flexibility, we regard TBF as an important factor.

Methodology

We arrived at this new factor of TBF during the course of factor analysis of the data related to 108 PD teams. The data was collected about the practices adopted by these teams to cope with change and uncertainty during the course of PD activity. The teams were surveyed about the practices related to decision making, formalization, autonomy, review procedures and flexibility in delaying decisions. During the course of exploratory factor analysis, we deduced five factors, TBF is one amongst them. We have culled out the results of factor analysis related to TBF and presented it in the below table (Table 1).

Table 1: Factor Loadings of 4 items Related to TBF Obtained after Varimax Rotation

Items	Loadings
Product related decisions were taken on time	0.263
Formal rules exist for carrying out a task.	0.668
Formal procedures exist to deal with situations that may arise during the course of execution of tasks.	0.770
Team doesn't have to strictly adhere to the procedures for doing the tasks (R).	0.576
% variance explained	16.317

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As can be seen in Table 1, the derived factor has items related to existence and adherence of formal rules along with a definitive time frame for making and executing decisions. This factor has dimensions of time and formal rules describing it. In a broad sense, the factor denotes a time bound implementation of rules and procedures during the course of PD. Hence we have named this factor as 'Time Bound Formalization' (TBF). The factor emphasizes the importance of time limits when implementing formal rules and procedures governing task execution or decision making.

Prior to collection of data and its analysis, we had to devise an appropriate methodology to ensure the correctness of the data. For this study, we adopted an ex-post facto, survey-based, cross-sectional design. A survey instrument was developed exclusively for this study and underwent two rounds of testing. Five point Likert scale was employed for capturing the responses. The final questionnaire consisted of 48 items. Cronbach alpha was used as a measure of Reliability. The derived factors had an alpha value of greater than 0.6, which is satisfactory. Content validity was also ascertained. Data required for the study was collected in two phases (pilot and main). Convenience sampling strategy was adopted for this study. The unit of analysis was teams. The population for the study was PD teams in public and private sector companies. Public sector was represented by teams in Defence based R&D companies, whereas private sector by software PD organizations. Companies with more than 10 years of PD experience and employing more than 1000 employees were preferred. Contact was made with respective HR heads or through known individuals in top management. The teams that participated in this study were identified by the HR heads or PD heads. Target respondents were Team Leaders or/ and Managers involved in Design and Development phase of the PD. A total of 120 responses were collected, out of which 108 were subjected for analysis.

Effect of TBF on Team Performance

To better understand the nature of TBF, we explored the impact of TBF on Team Performance. Team Performance can be measured in terms of both short term and long term perspective. While short term measures focus upon adherence to costs and schedules, long term measures relates to the value added to the project (Olsson, 2006). For this study, we consider the short-term perspective and define Team Performance as the '*Ability of a team to produce the desired output as per agreed costs and schedules*'.

To conduct this study, we categorised the teams into small and large ones. Teams which had more than 10 team members were considered to be large teams. Factor scores of TBF and Team Performance were used for conducting analysis. Since the variables TBF and Performance are continuous variables, Pearson's correlation co-efficient (r) was calculated between them for both small and large teams. Table 2 presents the results of correlation analysis.

Table 2: Pearson Product Moment Correlation (r) between TBF and Performance

Variable(s)	Team type	Performance (r)	p-value
TBF	Small (n = 59)	0.083	0.538
	Large (n = 44)	0.334	0.027*

Note : *p < .05, **p < .01, ***p < .001

In case of small teams, the correlation between TBF and Performance emerged insignificant (r = 0.083, p = 0.538), whereas, for large teams the correlation was significant (r = 0.334, p = 0.027). The results from the table indicate that introducing TBF and Performance is correlated only in case of large teams. This result has to be interpreted keeping in mind the nature of

small and large teams. Small teams differ from large teams in many of their characteristics. Generally, small teams are usually associated with better performance compared to larger teams. One of the important reasons attributed for better performance of smaller teams is that the communication and co-ordination is much easier (Hoegl, 2005). This type of efficient communication structure helps in reducing uncertainty and facilitates efficient reaction to changes, resulting in improved team flexibility. Small teams are usually subjected to a lower degree of formalization, thus providing greater autonomy and making them self-managed. In case of large teams, extensive efforts have to be made to promote communication through participation. With its inherent difficulties, large teams provide an advantage in handling complex tasks as they can accommodate people with diverse background and problem solving skills. With this background, a possible explanation of the result is that introducing TBF helps to improve the performance of large teams by limiting the time-consumed in decision making. The excess amount of time consumed by encouraging participation can be overcome by introducing practices of TBF. However, in case of smaller teams, which are already perceived to be efficient, TBF introduction might result in creating an upper bound on time which might be a redundant condition considering their higher efficiency.

Limitations and Scope for Future Work

This study has made an attempt to understand the role played by TBF and has been successful in shedding light on aspects of both TBF and PD Team Flexibility. However, there are some limitations that have to be addressed before we can agree on the findings conclusively. Firstly, TBF is a new factor that has emerged from our study. Hence it becomes imperative to validate the existence of such a factor through future studies. Secondly, we didn't find any impact of TBF on performance of small teams. Although it is an interesting finding, it can't be taken as the final word. This result has to be probed further in future studies. Thirdly, the sampling strategy adopted doesn't allow for generalizability of the results. Devising a better sampling strategy would be helpful in overcoming this drawback. Further due to confidentiality reasons, we were not able to get data related to the teams working on new products. Such a data would be helpful in accurately assessing the flexibility aspects.

Conclusions

The research related to Team Flexibility is still in its nascent stages. Through this study, we have attempted to contribute to the sparse literature on Team Flexibility, in general, and PD Team Flexibility, in particular. We have proposed a new factor named Time Bound Formalization and explored its relationship w.r.t Team Flexibility and Team Performance. This new factor was derived as a part of major study involving PD teams.

TBF is an important factor that helps to build PD Team Flexibility. TBF lays emphasis on time-aspect in the work standardization and can be considered to be a subset of formalization. Being a representative of a low degree of formalization, TBF can be inferred to contribute to increase of Team Flexibility. In addition to its influence on Team Flexibility, we found that TBF also impacts the performance positively only in case of large teams. TBF appears to compensate for the loss of time during decision making by large teams, which otherwise would have been consumed for facilitating participation in large teams. Thus, TBF maintains the required balance between flexibility (which requires team participation) and performance in case of large teams. With all its limitations, the paper has made a modest effort to contribute some interesting findings related to PD team flexibility. We hope this paper will act as a guide for future studies in this area.

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References

- Aiken, M. and Hage, J. (1966) Organizational Alienation: A Comparative Analysis, *American Sociological Review*, 31(4), 497-507.
- Ernst, H. (2002) Success Factors of New Product Development: A Review of the Empirical Literature, *International Journal of Management Reviews*, 4(1), 1-40.
- Evans, J. S. (1991) Strategic Flexibility for High Technology Maneuvers: A Conceptual Framework, *Journal of Management Studies*, 28(1), 69-89.
- Golden, W. and Powell, P. (2000) Towards a Definition of Flexibility: in search of the Holy Grail? *Omega*, 28(4), 373-384.
- Griffin, A. (1997) PDMA Research on New Product Development Practices: Updating Trends and Benchmarking Best Practices. *Journal of Product Innovation Management*, 14(6), 429-458.
- Hoegl, M. (2005) Smaller Teams - Better Teamwork: How to Keep Project Teams Small, *Business Horizons*, 48, 209-214.
- Langfred, C. W. and Moye, N. A. (2004) Effects of Task Autonomy on Performance: An Extended Model Considering Motivational, Informational, and Structural Mechanisms, *Journal of Applied Psychology*, 89(6), 934-945.
- Li, Y., C., C. K., Chen, G., H. and Jiang, J. J. (2010) Software Development Team Flexibility Antecedents, *The Journal of Systems and Software*, 83(10), 1726-1734.
- McComb, S. A., Green, S. G. and Dale, C. W. (2007) Team Flexibility's Relationship to Staffing and Performance in Complex Projects: An Empirical Analysis, *Journal of Engineering and Technology Management*, 24(4), 293-313.
- Olsson, N. O. (2006) Management of Flexibility in Projects, *International Journal of Project Management*, 24(1), 66-74.
- Pine, B. J. and Davis, S. (1999) *Mass Customization: The New Frontier in Business Competition*, Boston, Mass: Harvard Business School press.
- Sethi, A. K. and Sethi, S. P. (1990) Flexibility in Manufacturing: A Survey, *International Journal of Flexible Manufacturing Systems*, 2(4), 289-328.
- Smith, P. G. (2007) *Flexible Product Development: Building Agility for Changing Markets*, Hoboken: John Wiley.
- Tatikonda, M. V. and Rosenthal, S. R. (2000) Successful Execution of Product Development Projects: Balancing Firmness and Flexibility in the Innovation Process, *Journal of Operations Management*, 18, 401-425.
- Ulrich, K. T. and Eppinger, S. D. (2004) *Product Design and Development* (3rd ed.), New York: McGraw Hill.
- Volberda, H. W. (1999) *Building the Flexible Firm: How to Remain Competitive*, England: Oxford, University Press.