A STUDY ON ORGANIZATION CONTEXT AS ANTECEDENT TO PRODUCT INNOVATION IN SOFTWARE DEVELOPMENT ORGANIZATIONS

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Abstract
The main purpose of this paper is to investigate the relationship between Organization Context (as explained by performance management and social support) and Product Innovation outcomes (Radical Innovation, Incremental innovation and Speed to market). The hypothesis is tested using regression, correlation, mean scores and average of averages. The data has been collected from among the project teams of software development companies at Ernakulum and Trivandrum. The findings indicate high positive correlation between the variables organizational context and product innovation and the organization context in software development organization is a high performance context. The results of this study could be used by the managers of the software development organizations concerned to improve the performance management and the support system to maneuver the employees to handle successful innovation projects. Also it throws light on the desirable or the right context to be provided in the organization that can enhance the ability of the business unit to innovate. The results also provide companies operating software development sector in Kerala with useful information on how their policies and actions might affect exploration and exploitation of business unit competences and consequently firm innovation.

Keywords: Organisation Context, Product Innovation, Software Development Companies.

Introduction
Twenty-first century software development organizations undergo fast changes at tremendous speed. Their flexibility, adaptability, stability and survival ensuring product innovation rest on the ability to engage in rapid, relentless and continuous change. External and internal factors contribute to such changes. External factors include rapid technological change, globalization of market, and shrinkage of product lifecycle and enhancing aggressiveness of the competitors. Internal factors triggering change include organization culture, organization context and organization competence. Intense competition enthuses such organizations to strive for innovation leading to new product development. The research study specifically focuses on the effect of organization context on product innovation in software development organizations in Kerala.

Organization context is defined as the "often invisible set of stimuli and pressures that motivate people to act in a certain way" (Ghoshal and Bartlet, 1994). *Product innovation* is the development of new products, changes in design of established products, or use of new materials or components in the manufacture of established products (Michael White, Braczyk, Ghobadian, & Niebuhr, 1988; Jerinabi U. & Santhi P., 2012). Product innovation is the conception, development, designing and delivery of software products.

Software development organizations focus on making significant investments toward innovation in product and services. They champion innovation as the key determinant to future their businesses. Smart businesses know that constant innovation is a central strategy towards
future- proofing. This is to ensure competitiveness in an extremely dynamic business environment. Software development organizations assume a greater decision making role and responsibility to ensure long term role (Business Line, 2015).

Performance management and social support are the two dimensions of *organization context*. In software development organizations, project teams primarily participate in product innovation. There is immense pressure on the project teams to deliver the error-free output on time. Quite
often, there may be technical snags, bugs or malfunctioning of the software developed or installed at the client sites. This may turn out to be highly demoralizing to the project teams. The project teams may expect different types of support from the organizations for their performance.

Project teams may expect that they be directed well, more challenging tasks be assigned to them, mistakes committed be tolerated and better training be provided to them by the top management. They also expect that adequate trust may be provided to the project team by the organization. The two dimensions of performance management and social support that constitute organization context are studied through project teams. Too much of performance management or social support

may be detrimental to the organization. Too much focus on performance management without support and trust from the management may lead to burnout of the project teams. The teams may totally get exhausted and fatigued. This may affect the productivity of the teams and consequently the product innovation may be negatively affected.

Too much focus on social support without adequate performance management and discipline is also equally fatal to the organization. This can lead to a situation where productivity is less but the employees and teams are highly satisfied. This is also an undesirable condition for an organization since innovation is affected. In the organizations where performance management and social support are less, it is also an undesirable situation since product innovation can be low. So there should be an adequate, balanced mix of both these activities for the organization to be productive and innovative. This research is taken up with the intention of identifying and measuring the organization context provided by management for the software development project teams. Only if adequate and appropriate organization context prevailing in the organization is identified, can managers positively intervene to build the organization context to an optimal level where the project teams are intrinsically motivated in terms of challenging tasks and support. This may in turn help the project teams to exploit and explore competences of the business unit and thus enhance contextual ambidexterity. The two components of organization context which are considered for the study are performance management and social support.

Organization Context

It was Sumantra Ghoshal and Chris Bartlett (1994) who were the first to define the organization context. They defined organization context as "*often invisible set of stimuli and pressures that motivate people to act in a certain way*". It is the top management who shaped the context through systems, incentives, controls and actions which they take on a day to day basis and subsequently reinforced through the behaviour and attitude of the employees throughout the organisation. Ghoshal and Bartlett (1994) argued that four sets of attributes-stretch, discipline, support and trust interact to define an organization context. Gibson and Birkinshaw (2004) conducted another empirical study on the contextual factors and further reduced down the four dimensions into two through factor analysis. They are performance management, a combination of stretch and discipline and social support, a combination of trust and support. Performance management is concerned with stimulating people to reach out to the maximum and deliver quality products or outputs. Social support is concerned with providing employees with the security and autonomy they need to perform. Performance management and social support are not independent. These two factors are mutually reinforcing and interdependent. Literatures recognise that a strong presence of both creates a high performance context which in turn is a true facet of ambidextrous organization (Gibson and Birkinshaw5, 2004). In other words, ambidextrous organizations are characterised by high performance context and higher the high performance context higher is the contextual ambidexterity i.e. the exploitation and exploration of the competence of business unit. They further clarify that a less optimal organization context will occur, if there is an imbalance in these organizational characteristics or the lack of both. Also the leaders or the managers in the business unit develop contextual ambidexterity when they are backed by a supportive environment.

In their study, it is emphatically cited that "a highly demanding, result driven orientation that lacks social support will create burnout context". People who work in such a scenario get exhausted after some time and are depersonalized and the autocratic governance will enhance the employee turnover making the organization less ambidextrous. On the other hand "a strong social support without high performance expectation will engender a country club context" where in employees enjoy a comfortable lenient collegial environment but fail to enhance productivity to the maximum.

Product Innovation

Product innovation is defined by Damanpour (1991), as new products or services introduced to meet an external user or market need. Product innovation is defined as the development of new products, changes in design of established products, or use of new materials or components in the manufacture of established products (Michael White, Braczyk, Ghobadian, & Niebuhr, 1988; Jerinabi U. & Santhi P., 2012). Product innovation is the creation and subsequent introduction of a set of goods or service that is either new or improved on previous goods or services. This is broader than the normally accepted definition of innovation to include invention of new products which, in this context, are still considered innovative.

Objective of the study
- *To find out the relationship between Organization Context and Product Innovation.*

Hypothesis
There exists relationship between organization context and product innovation.

Population and sample
The population for the study consisted of the project teams in the software development organizations at Ernakulam and Trivandrum, Kerala. To reflect the differences anticipated in the heterogeneity of the project team, the nature of the project undertaken and to have a full coverage of all elements of the population, it was decided to adopt a census survey. Hence it was requested to distribute the questionnaires to 314 project teams to get their responses. Out of 314 questionnaires distributed, only 264 were received. The response rate was 84%. 14 questionnaires were discarded on account of missing values. Thus the final number of utilizable responses for analysis was 250.

A self designed questionnaire with the items from three standardized instruments, which was culturally adapted were used for collecting the information.

Pre-testing
The pretesting phase which was the initial phase of the design of instrument consisted of two stages. i) Preliminary study for checking the reliability and variability of the dependent variable and ii) Pilot study conducted to check the reliability and validity of the instrument. After those two stages the questionnaire for this study was finalized.

Preliminary study
Preliminary study is done for checking variability and reliability of
the dependent variable.

Reliability and variability of the dependent variable
a) Checking the variability of dependent variable
The study on the variation in dependent variable was pertinent in the research study because if the result showed that there was no variation in the dependent variable, the problem itself would have become irrelevant. Only if there is variation in the dependent variable, can the problem itself have the scope of being further investigated as to know the reasons or causes for such variations.

A preliminary study was conducted among 30 project teams of four business units of NEST Information Technologies Ltd., which is a major software development organization situated at Ernakulam and Trivandrum to find out the extent of variation in the dependent variable. At first, total of the eight items of the dependent variable from the instrument by Wang and Rafiq (2012) in the article "Ambidextrous Organization Culture, Contextual Ambidexterity and New Product Innovation: A comparative study of UK and Chinese firms" was taken for the study. Two items belonged to radical innovation, two to incremental innovation and four to speed to market.

Additional items were added on expert advice. There were altogether 20 items in the dependent variable to be tested for variation.

Discrimination value of the dependent variable- Product Innovation (PI)
The discrimination value of the dependent variable product innovation was found out by doing item analysis. Item analysis was not done with any of the independent variables since the items have been taken as such from three standardized instruments.

Pilot study
In the second stage of pretesting, a pilot study was conducted for testing the appropriateness of the research questions and for checking the reliability and validity of the research instrument. The pilot study was conducted with a pre designed standardized questionnaire on 55 project teams of business units of NEST Information Technologies Pvt. Ltd. Through the pilot study the reliability and validity of the whole instrument was established.

Sample Profile
Project teams in software development organizations represent the sample in the study. Sample profile shows the classification of project teams based on designation and software development unit size. Table 1 shows classification of the project teams based on designation.

Sample Profile
Table 1 Role/Designation of respondents in the project team

	Frequency	Percentage
Project Leaders	131	52.4
Project Managers	119	47.6
Total	250	100.0

Role/Designation is an important variable in the study as these are the people who are actually responsible for project teams which implement/develop innovative softwares in the organization. Hence the respondents namely project managers/project leaders were asked to indicate the designation category by selecting that designation which they belong to. Information is collected from 131 project managers and 119 project leaders which constitute 52.4 and 47.6% of total respondents.

Relationship between organization context and product innovation
The hypothesis to be tested here is,
Hypothesis two: There is a relationship between organization context and product innovation.

Table 2 Model Summery

r - value	R Square	Durbin-Watson	F - value	p - value
0.466	0.217	1.193	68.622	0.000

This table shows that the organization context and product innovation are highly correlated (r = 0.466 with p < 0.01). That is, as organization context increases, product innovation is also increases. Correlation is a measure of linear relationship only and to quantify the strength of the relationship between the variables, whereas regression expresses the relationship in the form of an equation.

Here the R square was reported to be 0.217, which means 21.7% of the variance in product innovation is addressed by the predictor variable organization context. The Durbin-Watson statistic is used to test for the presence of serial correlation among the residuals. Here, the value of Durbin-Watson is 1.193, approximately equal to 2, indicating no serial correlation. From the ANOVA, it was found to be significant with F = 68.622 and p<0.01. Hence we reject the null hypothesis and conclude that the regression is valid.

Thus we can conclude that *there is a significant positive relationship between organization context and product innovation in software development organizations*.

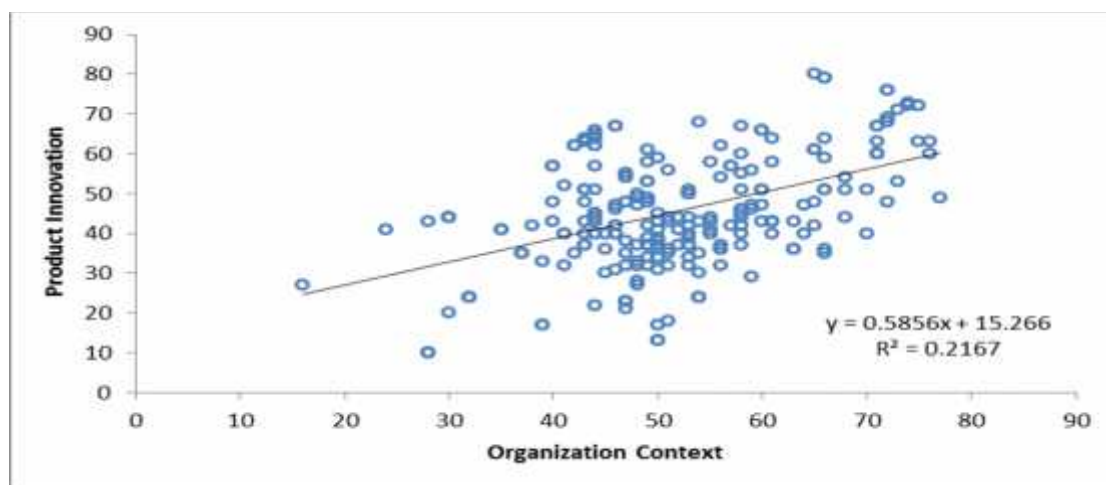**Scatter plot showing the relationship between Organization Context and Product Innovation**

y = 0.5856x + 15.266
R^2 = 0.2167

Table 3 Coefficients

	Unstandardized Coefficients		Standardized Beta	t - value	p - value
	Beta	**SE**			
Constant	15.266	3.749		4.072	0.000
Organization Context	0.586	0.071	0.466	8.284	0.000

Here both beta values are found to be significant as the corresponding p-values are less than the significant level 0.01. Then the regression equation explaining the relation between organization context and product innovation can be written as

PI = 15.266 + (0.586 * OC)

There are various literatures substantiating the pertinent significance of the role of contextual ambidexterity in organizations in firm's performance and innovation. Aravind Chandrasekaran (2010) in the study conducted on Hi-tech industry and concluded that out of the different types of ambidexterity namely structural, contextual and cognitive, contextual ambidexterity positively affects firm's performance. The study result showed that the units that simultaneously innovate and improve excelled other technological departments that focused on pure innovation and pure improvement.(Jansen, Simsek, & Cao, 2012) found out that unit-level ambidexterity positively impacts subsequent unit performance. Gibson and Birkinshaw, 2004 found out empirical evidence to prove that there is a strong correlation between ambidexterity and firm performance (r=.76, P<.01). Mike Rucker cites that Lubatkin et al (2006) found out that dual pursuit of exploratory and exploitative approach positively affects performance at the small and medium enterprise level. It also uncovered that the behavioral integration by the top management is essential to achieving ambidexterity. The research points to the influence that the top management team has a positive innovative outcomes and the importance of leadership in achieving ambidexterity.

More recently, Atuahene-Gima (2005) observed that the interaction of competence exploration and exploitation is negatively related to radical innovation performance. Similarly, Prieto et al. (2007) found that ambidexterity is positively related to new product development performance (Wang and Rafiq, 2012) found that the exploitation and exploration of competences positively affects product innovation. Performance management and social support and their interaction were found to be having a positive effect on performance of the firm (Gibson & Birkinshaw, 2004).

Descriptive Statistics of Product Innovation
The scores of mean, median, standard deviation and mean percentages of product innovation and its sub variables such as radical innovation, incremental innovation and speed to market are shown below.

Table 4 Descriptive statistics of product innovation

	Mean	**Median**	**SD**	**Mean %**	**Mid value**	**Category**
Radical Innovation	10.67	10.00	4.00	53.4	11.00	Average
Incremental Innovation	12.61	13.00	4.08	63.1	11.00	High
Speed to Market	22.34	22.00	7.57	55.9	22.00	High
Product Innovation	45.63	44.00	13.73	57.0	44.00	High

Interpretation: The radical innovation has the mean score 10.67 and mean percentage score of 53.4%, the incremental innovation has a mean score and mean percentage score of 12.61 and 63.1%, the speed to market has the mean score of 22.34 and mean percentage score of 55.9%. Product innovation has the mean score of 45.63 and the mean percentage score of 57.0%. The table shows that radical innovation is average having the mean score (10.67) the mid value (11.00) are approximately the same. Incremental innovation is high since the mean score (12.61) falls above the mid value (11.00). Speed to market is high since the mean score (22.34) is more than the mid value (22.00).

Table 5 Descriptive Statistics of Organization Context

	Mean	Median	SD	Mean %	Mid value	Category
Performance Management	29.26	29.00	6.97	69.7	24.00	Very high
Social Support	22.53	22.00	6.17	64.4	20.00	High
Organization Context	51.79	50.00	11.08	67.3	44.00	High

From the above table it could be seen that the extent of existence of *Performance management* is *very high* since the mean score 29.26 is very much higher than the mid value (24.00) and *social support* is also *high* since the mean score (22.53) falls above the mid value (20.00).

Hence it is established that the software development organizations at Kerala has a *high performance context* since both performance management and social support are high, which tells that software development organizations *is ambidextrous*. When comparing the mean percentages scores of the two dimensions of organization context also, it is found that the performance management score (69.7) is more than the social support (64.4). In short, the organization context is high performance context. Individually, the score of organisation context shows that its presence in software development organizations is high having the mean score (51.79) higher than the mid value (44.00).

Gibson and Birkinshaw, 2004 reiterates that only those organizations with high performance context are ambidextrous and that those with high performance management and high social support have a high performance context. When comparing the mean percentages scores also, it could be found that the presence of performance management is more than the social support. In short the organization context is high performance context. Individually, the score of organization context is also high.

Analysis on Organization Context
The organization context existing in the software development organizations in terms of performance management and social support is estimated as follows

Table 6 Analysis on organization context

	Performance Management	Social Support	Category
Software development organizations	4.876	4.507	High Performance Context

Key Findings on Analysis On Organization Context of The Software Development Organizations
1. It is found that existence of *performance management* is *very high* since the mean score (29.26) is very much higher than the mid value (24.00) and *social support* is also *high* since the mean score (22.53) falls above the mid value (20.00). Hence it is established that the software development organizations have a *high performance context* since both performance management and social support are high, which tells that software development organizations as a whole are *ambidextrous*.
2. When comparing the mean percentages scores of the two dimensions of organisation context, it is found that the performance management score (69.7) is more than the social support score (64.4). In short, the organization context is high performance context. Individually, the score of organisation context shows that its presence in software development organizations is high having the mean score (51.79) higher than the mid value (44.00).
3. By taking average of averages of the scores of the project teams, performance management dimension (4.876) is found to be more than the social support factor (4.507) which shows the presence of high performance context in the software development organisations.
4. There is a high relationship between organization context and product innovation.

Conclusion
The focus of this study was to find the relationship between organization context and product innovation. Since there is a high correlation between organization context and product innovation, the managers could provide the right kind of context

with high performance management and social support context so that product innovation is boosted. The project teams are motivated which could be inferred from the social support being high in the organization.

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