Survey on Long-Term Product Planning and Requirements Prioritization to Customer Value Creation

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Abstract— *Software development projects are subject to risks like any other project. Software development is subject to unique risks which can be mitigated through effective risk management techniques. Risks are unavoidable and must be managed. Successfully managing risks assists developers in completing the project on time and on budget. Strategies selected to manage risk may result in a better product than originally anticipated. Identifying, analyzing, tracking, and managing software risk aids crucial decision making including release readiness. Software project suffers from many problems like high computational cost, higher delay time in designing the projects, not meeting the actual need of the user, and many systems are being unutilized. These problems are solved using the software risk management which helps the software developer to identify, analyze, and accordingly deal with software risks items.*

Software risk management is also an attempt to define and formulate the risk oriented connection of success into a definite set of methods and techniques. Global Software development is learning and individuals escalated action. Individuals in such gatherings must work together, convey, and coordinate their work, which makes learning management a need. Point of the fact, little and stable associations where workers are inside an arm's compass of one another can most likely make without information management. In any case, for associations that are huge and appropriated, whose environment is consistently changing, or have a high turnover, dealing with their information stakes are basic for survival.

This Paper focuses on a pilot survey carried out at small software firms and results of employees are recorded and analyzed with help of IBM SPSS.

Keywords— Risk Management, management & computational cost.

I. INTRODUCTION

Project managers observe and aide the work of planners, designers and analyzes of software while now and again taking part in these exercises themselves. Where developer concentrates on code, construction modeling and execution, managers keep tabs on elevated amount concerns: the course of the project, allotment of assets, the list of capabilities, and the client experience. Supervisors work to synchronously fulfill stipulations imposed by clients, engineers, analyzers, maintainers and management.

Creating value for different customer segments is essential to the business of a company. Thus, software product development companies' ability to implement the most valuable requirements in their products has been seen as critical. The literature offers requirements prioritization methods for selecting requirements, but their suitability for solving practical challenges is not clear. The state of the practice in long-term product planning and requirements prioritization, and the practical challenges involved is not thoroughly analyzed. Therefore, the connection between the selection of product features and customer value creation is also an area that needs more investigation.

For a software development company, product development is an investment that should provide maximal added. Providing value for different customer segments by means of the product is a lifeline for the sales of the product, and via that, to the business of the company. Understanding what customer value means, and how to create value for a large number of customers, however, is not trivial in practice. From the product development viewpoint this means that a company needs the ability to implement the most valuable requirements in a software product in each product release. Especially in the software product business, the role of the successful selection of the feature enhancements (i.e., requirements) for product releases is

recognized as extremely important. Market-driven requirements engineering (RE), however, seems to entail special challenges, for example in requirements prioritization and release planning.

The ultimate sponsors of the project expect that the project's end result will add more value for them than they are paying the project team to create it. On a high level, this means that companies expect their product development organization to add more value to them than they invest in product development. The purpose of requirements engineering activities is to add business value that is accounted for in terms of software product's return on investment The need to make business-based product development decisions means that a company needs the ability to connect business management and software development .Only by integrating upstream (that is, long-term product planning) and downstream (that is, software development) processes, can value-based decisions concerning the future features of the products be made Long-term product planning is one approach that companies have used to bridge the gap between business planning and product development. Roadmapping is widely used as a technique in the manufacturing. The application of the roadmapping approach in the software engineering field is rather new and has not been investigated that much. Additionally, the practical implications of long-term product planning in software product companies in terms of the state of practice or of good practices are not systematically studied.

Some rationales for the challenges involved in requirements prioritization have been reported in the earlier studies. It is widely accepted that requirements prioritization involves complex decision-making. In order to prioritize requirements successfully, domain knowledge and estimation skills are required. In addition, requirements depend on each other and priorities are always relative. An important requirement in one release or to a certain customer may not be as important in the next release or to another customer. Political- and people- related issues are discussed, too For companies producing packaged software, the long-term planning and prioritization of requirements are even more challenging than for companies operating in project business. According to, the key differences between characteristics of packaged (market-driven) and bespoke software development concern stake holding and schedule constraints.

For requirements engineering this means that in the development of packaged software the future requirements of the software cannot be negotiated with just one or a few customers. Instead, requirements engineering decisions such as the prioritization of potential requirements to be implemented must be made within the company and be linked to the business decisions of the company In addition, time-to-market is, for many software packages, a survival attribute). The normal response to schedule slip in these market-driven cases is to concentrate resources on meeting the most critical requirements with minimal delay.

II. LITERATURE SURVEY

Customer value has many meanings in the literature, but two starting points dominate: value for the customer (customer perceived value or customer received value) and value for the firm (value of the customer, customer lifetime value) (Smith et al. 2007). In this thesis, the basic viewpoint on customer value is the former - customer's perceived value. Many authors have acknowledged the difficulties involved in actually defining customer value (e.g. (Woodruff 1997)). These difficulties stem from the subjectivity and ambiguity of value, which is compounded by the fact that customer value is a dynamic concept that evolves over time (Naumann 1995). Furthermore, in different disciplines, the value concept is multifaceted and complicated by numerous interpretations, biases, and emphases (Huber et al. 2001; Sharma et al. 2008). Common for many definitions of customer value is that the concept is related to the trade-off between perceived benefits (what the customer receives) and sacrifices (what he or she gives up) to acquire and use a product according to the customer's perception (Woodruff 1997). In order to truly analyse the customer value of the product, the benefits must be related to sacrifices a customer faces to get and use the product. Perceived benefits can be defined as "a customer's perceived preference for, and evaluation of, those product attributes, attribute performances, and consequences arising from use that facilitates or blocs achieving the customer's goal and purposes in use situations"(Woodruff 1997), not just product features.

The narrowest definitions see "customer value" as the level of return on the product benefits for a customer's payment in a purchase exchange (Normann et al. 1993). Wider definitions are not limited to monetary sacrifices, but assert that the judgment of value results from a trade-off between what the customer receives (e.g., quality, benefits, worth, utilities) and what he or she gives up to acquire and use a product (e.g., price, sacrifices) (Woodruff 1997). According to Smith and Colgate (2007) it is unclear whether customer value is a summative (benefits less sacrifices) or ratio (benefits divided by sacrifices).

According to Slater (1997), firms exist to create value for others where it is neither efficient nor effective for buyers to attempt to satisfy their own needs. Many marketing strategists and industrial organization economists emphasize that creation of superior customer value is a key element for companies' success (see e.g. (Porter 2004)). Customers do not look for

products or services per se; they look for solutions which they can use so that value is created for them (Gronroos 2007). Knowing where the value resides from the standpoint of the customer has become critical for suppliers (Ulaga et al. 2001) because greater levels of customer satisfaction lead to greater levels of customer loyalty, positive word-of-mouth, and a stronger competitive position (Bearden et al. 1983; Fornell 1992). Customer value is considered central to both competitive advantage and long-term success of business organizations (Khalifa 2004)

Methods that combine aspects affecting priorities

Method	Short description	Reference
AHP (Analytical Hierarchy Process)	All unique pairs of items are compared to determine which of the two is of higher priority, and to what extent.	(Saaty 1980)
Hierarchy AHP	A modification of AHP in which only requirements on the same level of a hierarchy are compared with each other.	(Saaty 1980)
Cost-value approach	AHP-based method in which all possible requirement pairs are compared according to their importance and implementation costs. The percentage share that a requirement has for total value and the total costs of all requirements are calculated for each requirement. (Cost-value approach is one instance of Hierarchy AHP)	(Karlsson et al. 1997b)
Ordinal cost-value ap-proach	Requirements are put into three groups according to their value to customers and into three groups according to their implementation costs. The results are presented in a cost-value scattered diagram.	(Karlsson et al. 2005)
Wiegers' method	Each requirement is evaluated on a scale from 1 to 9 accord-ing to its value to the customer, the penalty if it is not imple-mented, implementation costs, and risks. Priority is calculated by dividing value + penalty by cost + risks.	(Wiegers 1999)
Impact validation	The impact that each proposed requirement has on the achievement of the high-level goals of the project is evaluated on a defined scale. For each requirement an impact sum is calculated. The requirement having the greatest impact is seen as the most important and so on.	(Gilb 2005)
MDRPM (Market Driven Requirement Prioritization Model)	AHP with a consistency check added to the normal procedure.	(Iqbal et al. 2010)
Simulation-based Fuzzy Multi-attribute Decision Making	Model takes the imprecise nature of requirements into account by modelling their attributes as fuzzy variables.	(Ejnioui et al. 2012)

Racheva et al. (2009) were, however, able to identify some characteristics to business value

- Business value in practice tends to be qualitative
- Business value tends to be subjective
- The sources of business value drive requirements prioritization
- Business value of the IT solution requires a degree of trust
- The business value and IT solution tends to be dependent on non- IT business processes

Requirements prioritization started to gain interest in the requirements engineering research in the nineties, when general RE studies noted the challenges and importance of prioritization (Lubars et al. 1993). In the late nineties, authors also started to introduce methods for prioritizing requirements (e.g.(Beck 1999; Karlsson et al. 1997b; Wiegers 1999)), which continued in to the twenty-first century (e.g. (Berander et al. 2006a; Herrmann et al. 2008; Lauesen 2002; Leffingwell et al. 2003). The literature offers several methods for requirements prioritization. As requirements prioritization could be seen as a basic sorting problem of items, in theory any algorithms could be used to put a set of requirements in order. Comprehensive lists of methods and sorting algorithms proposed for requirements prioritization in the literature are presented e.g. in (Herrmann et al. 2008), (Kukreja et al. 2012) and (Racheva et al. 2010b).

Different requirements prioritization methods introduced in the literature seem actually to be intended for slightly different purposes. These purposes can be e.g.:

- Sharing limited product development resources and solving conflicts between different stakeholders (e.g., voting, million dollar test)
- Collecting opinions from different user and customer groups about their preferences (e.g. top ten requirements)
- Analysing requirements from different viewpoints (e.g. Wiegers' method, Cost-value approach)

III. INDENTATIONS AND EQUATIONS

3.1 Data Collection & Analysis

A) Selection of organization

- Ten small and medium level enterprises were selected based on convenient sampling.
- The investment of software companies was lesser than 20 Lakhs

B) Sampling population

- As many as 80 samples were included as part of data for the study. The Participants belonged to all the three various levels of organization.

C) Data collection

- An exhaustive questionnaire was prepared and data was collected with regard to understanding requirements prioritization

D) Stages of Data collection

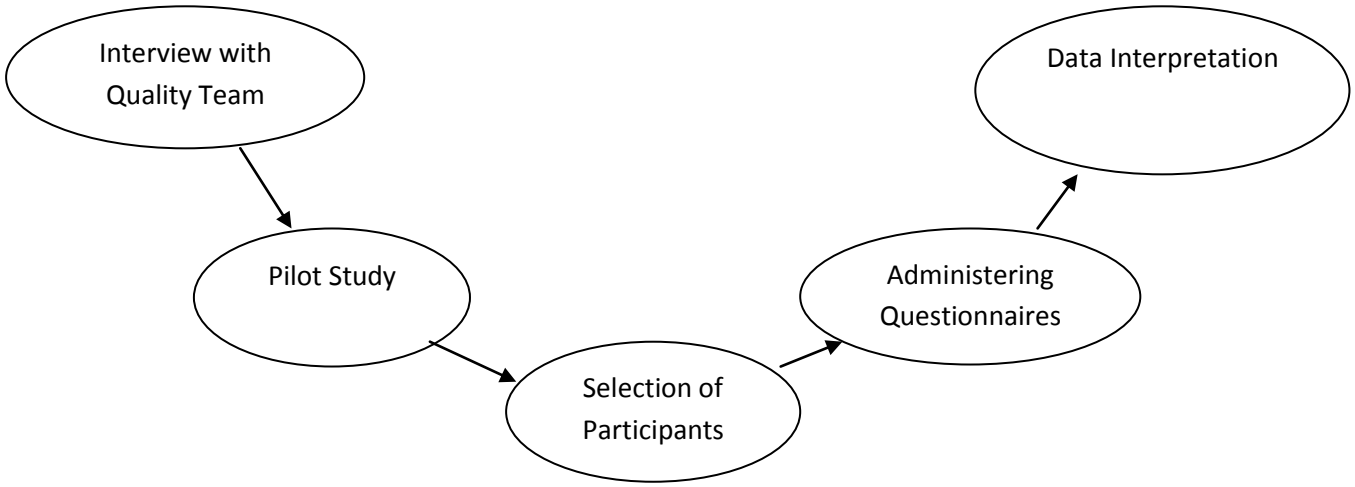

FIGURE 1: STAGES OF DATA COLLECTION FOLLOWED BY AUTHOR

3.2 Hypothesis:

H1 - A positive relationship exists between Product and satisfaction of customer

H2 – Value of your product is directly proportional to satisfaction level of customer

TABLE 1
MEAN AND STD. DEVIATION OF FEW QUESTIONS

	Mean	Std.Deviation
Which of the following words would you use to describe our products	18	.86
How well do our products meet your needs	19	.92
How would you rate the value for money of the product	20	.75
How would you rate the quality of the product?	17	.62
Which of the following words would you use to describe our products	19	.56
How well do our products meet your needs	20	1.2
How would you rate the value for money of the product	18	.98

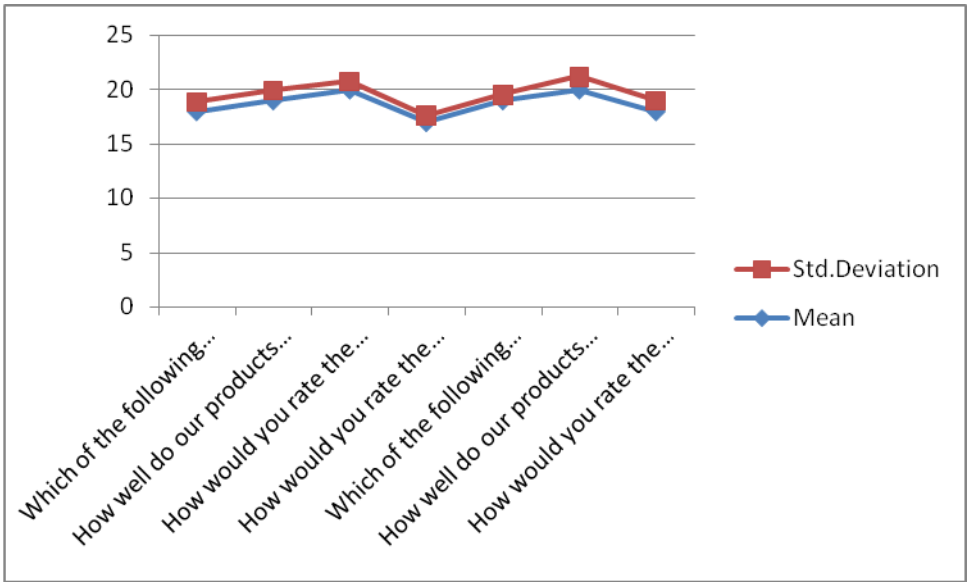

FIGURE 2: LINE GRAPH REPRESENTING MEAN AND STD. DEVIATIONS

TABLE 2

RESPONDENTS OPINION FOR DESCRIPTION ON PRODUCTS

Which of the following words would you use to describe our products	
Reliable	30
High Quality	10
Useful	10
Good value for money	15
Overpriced	4
Impractical	3
Ineffective	1
Poor Quality	0

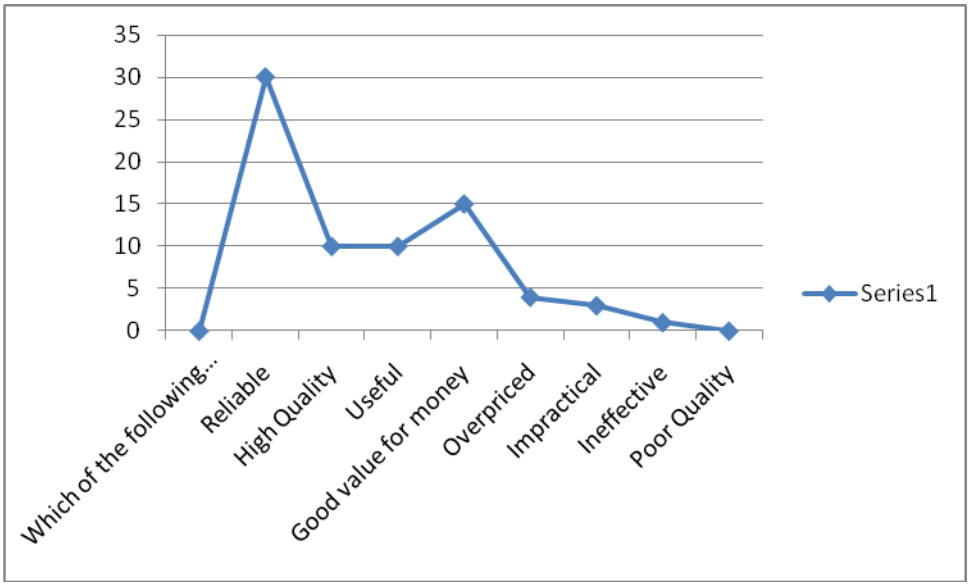

FIGURE 3: LINE GRAPH REPRESENTING QUALITY OF PRODUCT

TABLE 3
RESPONDENTS OPINION FOR CUSTOMER SATISFACTION

How well do our products meet your needs	
Not at all well	5
Extremely well	30
Somewhat well	15
Very well	20
Not so well	10

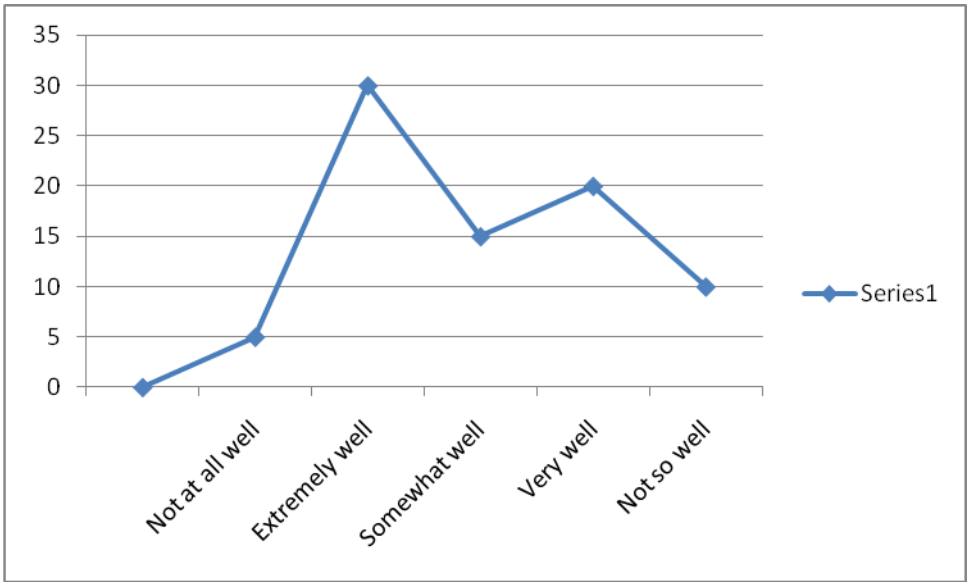

FIGURE 4: LINE GRAPH REPRESENTING CUSTOMER SATISFACTION LEVEL

3.3 Analysis & Interpretation

- The Data collected has been primarily tabulated & Master table was prepared
- Sample was tested for reliability using Cronbach's alpha
- Percentage analysis is the basic tool for analysis
- Regression analysis a statistical process for estimating the relationships among variables is used

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability. A "high" value for alpha does not imply that the measure is unidimensional. If, in addition to measuring internal consistency, you wish to provide evidence that the scale in question is unidimensional, additional analyses can be performed. Exploratory factor analysis is one method of checking dimensionality. Technically speaking, Cronbach's alpha is not a statistical test - it is a coefficient of reliability (or consistency).

Cronbach's value was 0.82

3.4 Regression Analysis

MODEL SUMMARY-1

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.843[a]	.652	.650	.747

Dependent Variable(X): A positive relationship exists between Teaching and students

Independent Variable(Y): How well do professors teach in college

In Model Summary 1 – 0.84 means that 84% of the variation of y-values around the mean is explained by the x-values. In other words, 84% of the values fit the model.

H0 – No relationship exists between Product and satisfaction of customer

H1 - A positive relationship exists between Product and satisfaction of customer

MODEL SUMMARY - 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
2	.710[a]	.757	.755	.725

Dependent Variable(X): Innovative methods will help in enhancing results

Independent Variable(Y): How helpful is your mentor

In Model Summary 2 – 0.71 means that 71% of the variation of y-values around the mean is explained by the x-values. In other words, 71% of the values fit the model.

H0 - Value of your product is not related to satisfaction level of customer

H2- Value of your product is directly proportional to satisfaction level of customer

Alternate Hypothesis is accepted.

IV. CONCLUSION

A positive relationship exists between Product and satisfaction of customer & Value of your product is directly proportional to satisfaction level of customer are accepted by the pilot survey conducted For researchers, this study shall provide a broad analysis of the practical challenges and characteristics of requirements prioritization and long-term planning in market-driven software development. Our results indicate that requirements prioritization in practice is a broader issue than just comparing a set of requirements at the same level of abstraction with each other, as is assumed in many existing prioritization methods. Our results shall provide implications to researchers about what should be taken into account when developing methods and practices for requirements prioritization and long-term planning. For example, the researchers in the field might benefit from understanding that the three main aspects (business, customer& users, and implementation) are used in practice in requirements prioritization.

ACKNOWLEDGEMENTS

The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of the individuals, we are greatly indebted to, whom through guidance and providing facilities have served as a beacon of light and crowned our efforts with success. We are thankful to Management of East West Institute of Technology Bengaluru, Principal & Director Dr. K Channakeshavalu, VTU Research Centre of Department of Computer Science & Engineering at EWIT

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