

Requirements Engineering and Its Role in Mobile Telephone Industry Development

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Abstract—This paper deals with the requirements engineering (RE) for developers of mobile telephones, and its role in mobile telephones technology development. RE is one of the most critical task in mobile telephones industry activities, because of the highly dynamic market change, especially in mobile telephony devices to meet the market needs in short time. In mobile telecommunication devices, to meet the market needs in short time RE must be properly involved in the life cycle of the development process. However, it is too often regarded as useless and overly time consuming, because nonfunctional and functional requirements can be elicited using separate teams and process, on the other hand by using RE process in product life cycle, RE tools increase productivity and quality, customer is properly managed. In this paper we proposed main problems that stand on the way towards an optimal RE practices in mobile telephone sector. Successful product development depends gradually on collaboration between the many individuals and teams involvement including system engineers, software engineers, electronic and telecommunication engineers and the engineering director, also a high degree of cooperation between the industry and research world is essential in order to achieve success in RE phase of product development in mobile phone industry.

Index Terms—Requirements engineering, mobile phone industry, requirements elicitation, telecommunication industry.

I. INTRODUCTION

In the past few years wireless mobile telephones are so simple, limited features, large in size, with the passage of time peoples expect for more than just a cell phone, extra features such as MP3 player, Video player, e-mail capabilities, web browsers and various productivity applications, we can say that connectivity has converged with entertainment and productivity. Telecommunication companies are in competition to add the features that customer want in daily life.

Now a days peoples want a small and smart mobile phone with light weight and extra functionality, different people show different demands, so it depend the company how it satisfy the users with their needs based on RE. Every Telecommunication industry try to get a good place in a market by attracting the peoples by the new product with new features in flexible way regarding software and hardware [1].

II. BUILD YOUR OWN PHONE WITH PROJECT ARA

Android phones attracts the peoples by providing the flexibility in installing the software applications in own devices as they want to use. Now a days the Google owned company Motorola has just announced the project Ara, a free, open hardware platform for creating highly modular smartphones [2]. An endoskeleton, or structural frame, holds the smartphone modules of the owner's choice, such as a display, keyboard, or extra battery. To attract the people Motorola want to do for hardware what the Android platform has done for software. The design for Project Ara consists of an endoskeleton (endo) and modules. The endo is the structural frame that holds all the modules in place. A module can be anything, from a new application processor to a new display or keyboard, an extra battery [3]. Fig 1 shows a modular smart phone, a user fitting a camera in his device.



Fig. 1. A user fitting a camera in his mobile phone [2], [3].

III. ROLE OF RE IN MOBILE TELEPHONE INDUSTRY

One problem with the software industry is the lack of common definitions for terms we use to describe aspects of our work. Different observers might describe the same statement as being a user requirement, software requirement, functional requirement, system requirement, technical requirement, business requirement, or product requirement. A customer's definition of *requirements* might sound like a high-level product concept to the developer. The developer's notion of requirements might sound like detailed user interface design to the user. This diversity of definitions leads to confusing and frustrating communication problems[4], [5].

Consultant Brian Lawrence suggests that a *requirement* is "anything that drives design choices" (Lawrence 1997). Many kinds of information fit in this category. The *IEEE Standard Glossary of Software Engineering Terminology*

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(1990) defines a requirement as

- 1) A condition or capability needed by a user to solve a problem or achieve an objective.
- 2) A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed document.
- 3) A documented representation of a condition or capability as in 1 or 2.

Requirements engineering is a vital process that helps companies manage complex requirements, improve team collaboration and ultimately produce high-quality products more cost-effectively [6], [7]. The proposed paper explores requirements engineering and how it affects product development and engineering in the industrial segment. It also discusses the best practices and benefits of requirements engineering [8]. A high-quality software requirements specification (SRS) is an essential precondition for the development of a successful software system. High-quality in requirements engineering refers to criteria like consistency, completeness, correctness, clarity, structure, unambiguity, minimality, traceability, and maintainability [9], [10]. (See Fig. 2).

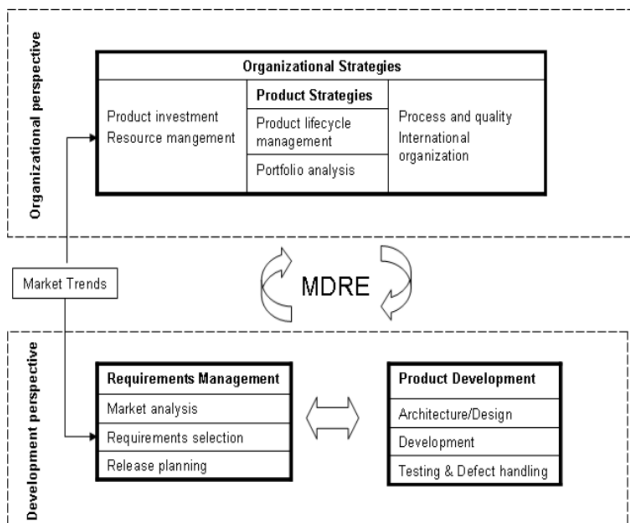


Fig. 2. Different perspectives of software product development [9], [11].

IV. THE CHALLENGES OF REP IN MOBILE PHONE INDUSTRY

A. Lack of Global Standards

Requirements management for mobile telephones is very complex because of the lack of a global standard transmission protocol, the numerous product customizations and the variations due to local standards [12], [13].

B. Complexity Due to Increase in Number of Services

Complexity in requirements engineering process increases by increasing the number of services in the mobile telephone devices, device take extra memory and make the system so complex that it show low performance and reduce processing speed also [14]–[16].

C. Reuse and Legacy Management

New requirements must be added in upcoming mobile phone devices by using the existing relevant software features, must be change from the previous products [16]–

[18]. New features in upcoming products attracts the users. These are the features that make the telephony devices more complex [19].

V. PROBLEMS FOR REP DEVELOPMENT IN MOBILE TELEPHONE DEVICES

Ambiguous requirements lead to ill-spent time and rework.

Gold-plating by developers and users adds unnecessary features.

Insufficient user involvement leads to unacceptable products [20].

Inaccurate Planning, Incompletely defined requirements make accurate project planning and tracking impossible.

Overlooking the needs of certain user classes (stake holders) leads to dissatisfied customers.

Minimal specifications lead to missing key requirements. Variations in user demands also effect the REP [21].

VI. MEETING CHALLENGES IN THE TELEPHONE INDUSTRY

Requirements engineering can help overcome the following challenges in developing technology within the telecommunications/telephone industry.

A. Cost-Effect Innovation

Telecommunications networks need innovative products to win market share. But to improve profit margins, they need to differentiate their brands and enhance performance while at the same time accelerating lifecycles, reducing costs, assuring quality and delivering product excellence, also RE is not integrated with the development methods [12], [21].

B. Better Collaboration with Telecommunication Networks

Reducing development costs and managing complexity require close partnership and integration between network technology providers and the telecommunications enterprises they serve. That means making some fundamental changes in the way they do business [12]. They need to align design and product development with rapidly changing customer requirements while increasing product quality and reducing time to market and cost. Most of all, they must capture the requirements of their network customers quickly, reliably and in a collaborative environment [12], [22].

C. Gap between Requirements and Software Architecture

The biggest effort in production of mobile telephones goes into software development. In a market where a new product family needs to be launched every few months, software development can involve fatal delays. In most cases, the root of the problem can be found in weak connection between the set of requirements and software architecture. When requirements and architecture evolve separately, the product failure alarm should ring. These problems occurs when the staff developing the architecture has little voice during elicitation of requirements [16]. Symmetrically, the people that perform requirements elicitation are not consulted during the architecting phase.

Only a few key requirements are considered when developing the architecture, and the rest of the work is left to the component developers. Hence, in this paper we proposed that software architecting and requirements engineering cannot be separated. Software architecture is the high level solution to the problems posed by the requirements. The set of requirements should develop hand in hand with the architecture [23].

VII. CONCLUSION

Efficient and cost-effective product development is key to success in today's global development environments. A requirements engineering approach can help product development organizations work in harmony as they communicate and collaborate through standardized processes for requirements management. When requirements are traced and managed across teams and the development lifecycle, enormous amounts of rework can be avoided. Looking at the future, we foresee that an increasing number of projects will experience problems or, in extreme cases, failure due to a bad REP. Finally, RE helps organizations enhance collaboration among globally distributed teams and suppliers. This means that virtually all stakeholders can be involved in the requirements management process and be confident that everything they do is aimed at fulfilling customer requirements. The requirements engineering best practices of complexity management, requirements traceability and collaboration can help you reduce time to market, cut costs, deliver higher-quality products, improve customer satisfaction, simplify regulatory compliance and achieve a greater competitive advantage.

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