Chapter 13

A Managerial Perspective for the Software Development Process: Achieving Software Product Quality by the Theory of Constraints

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ABSTRACT

The companies will become the center of business with the Industry 4.0 revolution implementing IT integration, cloud-based applications, data management, rapid decision-making operations, etc. These transformations can be realized with an effective project management, and project managers have a big role in this context. The quality of the software is very important for Industry 4.0, given that it can be as strong as the weakest link in a chain. Collaboration between producers and customers plays an increasingly important role in software processes where agile applications have recently been proposed. In this chapter, for the success of the project manager, Theory of Constraints is applied to remove the problems that may be encountered with the implementation of the agile methods during identifying the problem and determining its solution. The proposed solutions to uncover the reasons not reaching the targeted quality and removing the obstacles will be a guide for software project managers.

INTRODUCTION

In today’s digital revolution, the structures that define Industry 4.0, such as autonomous robots, smart factories, cybersecurity, cloud computing, system integration etc., are entirely combined with software (Hermann et.al, 2015). Highly qualified software product affects the systems directly to be operated accurately. For this reason, software developers play a major role. Rapid changes in technology and customer requirements require frequent releases of software products. To respond to this problem, agile
methodology is generally proposed while developing software (Sun and Schmidt, 2018). All software projects in which the agile approach is used begin with discussions on user stories and continue with opinions on release planning and iteration planning (Cockburn, 2007). Software is a teamwork, and the development of a coding standard is an experience to be constituted by the cooperation of team members. Developers should agree on coding standards, and it is one of the major responsibilities that developers have to realize during the development (Wang, et al. 2008). During setting the coding standards, it is important to consider the industry standards that is appropriate to the product being developed.

Any interface that is mostly used in an Industry 4.0 project may also be required to use by other systems. An organization may use more than one web services, and these services are probably provided by different systems. It is required to know which services are ready to use. This structure is called as ‘service-based architecture’ and, is widely used by Industry 4.0 projects (Erl, 2016). Thus, a legacy database where it belongs to another company is accessible. For example, the person in charge of a transport company can follow the highway passes and petrol purchases of the trucks that are dispatched. The company can only access the data of other companies by knowing their structure and semantics. However, it is also important to know the renewal time of instruction, if the data to be used is in the batch processing architecture (Tamrakar, et al, 2017). In order to change a system or to develop a new system, the routine entities existed in the organization must be organized as existing legacy assets. Industry 4.0 solutions provide solutions and services through the cloud for the integration of data, people, workflows and legacy systems (Rennunga et al., 2016). Product control systems are transformed into open databases and transparent interfaces by service-oriented architecture. Versality is a very important content of smart factories as one of the four fundamental rules of big data (Abaker, et al., 2014). The standard interfaces and application modules should be able to change in a short time; continuously coming data can also vary its type. Moreover, different simulations will not only save time, but also reduce cost during product development. Moving the simulations done in real programming languages to the hardware environment will also contribute to success (Gokalp, et al, 2017).

The new industrial products will soon be the combination of communication networks and physical systems to form a single entity. This is called as Cyber-Physical System (CPS), which is an important characteristic of Industry 4.0 (Kagermann et al., 2013). In the future, the production demands will be supplied by CPSs in other words by smart factories. These processes will be accomplished by standardized and mobile factories, open interfaces, which confirm industrial standards, and plug and procedure methods. All these transformations require agile, flexible, openness to change and efficient approaches. Seamless, modular and extendable systems, and the integration of the used software with the current technology will be emphasized (Chen, et al., 2017).

A web-based visualization ensures the integration of all devices in a system, then the relations between the terminals are monitored. This new technology called as ‘smart grid communication’ is an Internet of Things (IoT) protocol integration. It sends the values such as temperature, vibration, humidity, operations, weather, and meters to a substation control system (Prasad, 2014). From here, cloud computing and grid monitoring can mutually be carried out. Systems connecting nations have widely begun to use beginning at the second half of 2010. These are IoT and cloud services as new communication tools that constitute Industry 4.0. Thus, the importance geographical distribution has been removed. The standards will become more important when the transition into smart grid technology and the integration of legacy systems are provided (Faheem, et al., 2018). For example, the creation of a competitive environment in the energy sector will lead to more economical use of resources, and the integration of distributed energy resources will be possible. This means new standards in the communication. As a result, more informa-
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