International Journal of Computer Trends and Technology
ISSN: 2231 – 2803 / https://doi.org/10.14445/22312803/IJCTT-V69I11P106

Volume 69 Issue 11, 37-39, Nov, 2021

Original Article

The Requirements Elicitation Pyramid – A Theory of Requirements Evolution

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Received Date: 08 October 2021
Revised Date: 13 November 2021
Accepted Date: 26 November 2021

Abstract *- Business Analysis is the process of understanding complex business requirements and transforming them into a User-friendly solution. To meet the increasing needs of Business, there has been an evolution of technologies like Predictive Analytics, Artificial Intelligence, Cloud Computing, Machine Learning, etc. This paper presents the evolution of Business needs over time-based on technology trends and correlates the same to the level of requirements elicitation to be performed in a given Project. It also draws an Analogy to basic Maslow's theory of human needs (although there have been some developments to the theory lately) and compares it to the evolution of business needs and the role of Business Analysis at each stage. The 5 evolving stages of requirements are Data Capture and automation (bottom of the Pyramid), Security, Integration, User Experience, and Analytics (top of the Pyramid). As we progress from bottom to top of the pyramid, the responsibility of Business Analysis to make recommendations to elicit the requirements from the user's increases*

Keywords *- Requirements Gathering, Requirements Gathering, Pyramid of Requirements, Business Analysis*

I. INTRODUCTION

Requirements Gathering and analysis is a critical process in any IT/Software implementation. It is the process of documenting the user requirements by using various requirements elicitation techniques. There are 2 broad categories of Requirements elicitation techniques as below [1],

- Direct Approach: This includes Interviews, Case Study and Prototypes
- Indirect Approach: This includes Questionnaires and Documents analysis

With the advancement in technology, the user's expectations from a software/technology implementation have increased hence increasing the complexity in capturing the user requirements. It often gets problematic while trying to capture all the requirements without a systematic approach. This paper presents a framework for a systematic approach to Requirements Elicitation in a Project, starting from basic requirements to advanced requirements correlating to the adoption of emerging technology trends by organizations and drawing an analogy to Maslow's Theory of Human Motivation.

Maslow's Theory of Human motivation displays the order of human needs in the form of a Pyramid with the lowest levels made up of the most basic needs, i.e., Physiological Needs moving on to the top of the pyramid with complex needs. Below is a glimpse of the 5 levels of the Pyramid from bottom to top [2],

A. Physiological Needs

The basic human requirements to survive would comprise Physiological needs like Food, Water, warmth, and rest.

B. Security/Safety

Once the Physiological needs are satisfied, the need for security and safety arises. This comprises financial, emotional, social security, and health and well-being.

C. Love/Belonging

These needs are driven by interpersonal relations like friendship, love, trust, and acceptance among individuals.

D. Self-Esteem

The fourth level of needs arise out of the feelings of getting praised by others for self-accomplishments, be it professional, academic, athletic, or personal.

E. Self-Actualization

The final level of needs reflects the realization of individuals to utilize the complete potential so that they can do the best that they can do.

By drawing an analogy to the above-mentioned stages of Maslow's Human Motivation Pyramid and citing the technology trends at each stage, we proceed to build the Requirements Elicitation Pyramid as below, starting from basic data requirements to the complex analytical requirements to explore the full potential of the system.

II. BUILDING THE REQUIREMENTS ELICITATION PYRAMID

The 5 layers of the Requirements Pyramid are Data Capture and automation (bottom of the Pyramid), Data Security, System Integration, User Experience, and Analytical Capabilities (top of the Pyramid). These layers

are being derived based on the Technology Trends and the adoption of the same by Organizations in their software implementations over the past several years. The stages of the pyramid can be used as a Benchmark to perform Business Analysis and progress in the Requirements elicitation journey while implementing an IT Project. As we progress from bottom to top of the pyramid, the complexity of Requirements increases resulting in the complexity in the requirements elicitation. The stages are being detailed below by illustrating an example of a CRM (Customer Relationship Management) implementation.

A. Data Capture and Process Automation

The initial IT implementations started with the organization's requirement to capture data and automate the tasks of Users to save resources like time and money [3]. This is similar to the basic need of Humans like Food, Water, etc., i.e., Physiological Needs in Maslow's Pyramid.

This serves as the basis for any Project implementation that should start with the Data Capture and automation requirements. In general, any IT implementation would start with a problem statement where the Business has an issue with missing data capture or users spending their valuable time on mundane, repetitive tasks which could be automated. This stage is critical and covers most requirements serving as the foundation of the IT implementation, similar to the Physiological needs, which serve as the basis for human survival.

In our example of CRM implementation, the data that needs to be captured like Customer Accounts, Business Leads, Sales Opportunities, Customer Contacts need to be captured at parameter level with respective UI forms for data capture along with data validations. Also, the automation governing the system functionality needs to be captured. For example, updating a parameter in Customer Accounts from the corresponding parameter on the Customer Contact record.

B. Security

Once the required data is being stored and processes automated, Organizations have started focusing on Data security both within and outside the organization. This was the result of a series of Data breaches and the penalties few organizations had to pay for the same [4]. Hence, once the basic requirements are established with respect to Data storage and automation, the security of the data recorded in the system becomes critical, just like the need for Security in human life.

This serves as the foundation for the next stage of Requirements elicitation in a Project which is capturing the Data Security requirements of the organization. Different users, depending upon their role and function in the organization, would need access to different data elements and the level of access to the same (for example, Read vs. Write). Also, every organization would have business rules governing the portion of the information it would like to expose to outside the organization and the level of authentication required for the same. These requirements need to be captured as part of the Security requirements.

In our example of CRM implementation, the Sales team requires read/write access on Opportunity data, whereas the Finance team would require only read access to Opportunities for forecasting, and the Operations team may not need access to Opportunity data at all. Even in the same Sales team, for example, individual users may not prefer their data to be seen by other team members. Hence, the Security of the data forms the next level of user needs to feel secure while using the application.

In the same CRM implementation example, the organization may want to share their Sales data with specific external distributors using some authentication. The Data Security and exposure requirements to External parties need to be captured as well.

C. Integration

Once the data recorded in the system is secure, the next need is to communicate with other systems to exchange information and complete the end-to-end business transactions. Multiple Integration tools and platforms with on-premise and cloud architecture have evolved as a result of the need to optimize the communication between systems. These integration platforms support real-time vs. scheduled information exchange between the systems [5][6]. This is like the human need for interpersonal relations like friendship.

This paves the way for the third stage in Requirements Elicitation in a Project which is the Data Integration requirements. In general, different systems act as the system of record for various data elements within the IT Architecture of an organization. Also, in most cases, there is a Master data system like ERP where all the critical data gets stored. It is critical to identify the source of the required data for an application to work, i.e., manual entry vs. systematic entry, and identify the downstream systems which would use the data from the application.

In our case of CRM implementation, the Customer Account information would generally be recorded in the ERP, so the CRM system needs to integrate with the ERP to get the Customer Account information. Similarly, the Order information from CRM would be used by downstream order fulfillment applications, so the CRM system needs to integrate with the downstream application to complete the Order fulfillment process.

D. User Experience

Once a well-integrated system is established with the required basic functionalities to fulfill the everyday job of the user, the "user experience" comes in, which further drives the requirements to make the system more intuitive and user friendly, hence leading to the appreciation of system by the users. The need to improve User experience has driven the rise of emerging technologies like Cloud

Computing to make data access device and location agnostic [8], Mobile Apps to access data on the go [8][9], and advanced User Interface to improve the aesthetic feel of the system [7]. This is like the self-esteem requirements of humans

This leads to the fourth stage of Requirements elicitation in a Project which is the User Experience requirements of the organization. Once the functional requirements from the user are gathered, the requirements for a better user experience need to be captured as part of the overall requirements. This would include aesthetic requirements like the look and feel of screens, systematic guidance while navigating the system, mobile usability, Cloud vs. On-Premise databases, etc. Although these requirements may not sound critical during the initial implementations, they turn out to be critical once the users start adopting the system.

In our example of CRM implementation, the Sales Representatives might need access to Customer information/ Order information on the go, which would lead to providing the mobile capability, or the information may need to be accessed across the globe, which would lead to Cloud-based implementation or the user requirement to have systematic guidance and better look and feel would drive the implementation of better User experience technology.

E. Analytics

Once the system is fully functional and user-friendly, the analytical insights that the data could provide to the user becomes important, as this enables the user to explore the complete potential of the system and enhance decision making. The need for businesses to gain analytical insights from data has given rise to powerful technologies like Artificial Intelligence, Machine Learning, and BlockChain, which perform complex analytics on data to derive insights and make the best use of data [10][11][12]. This is like the need for the realization of individuals to utilize the complete potential so that they can do the best that they are capable of doing.

This leads to the fifth and the most complex stage in Requirements Elicitation, which is the Analytical Capabilities. In most Projects, the user may not be directly able to give requirements with respect to Analytical capabilities, so the requirements elicitation should focus on determining the KPIs (Key Performance Indicators) for the business users and recommend the suitable analytical capabilities around the same.

In our case of CRM implementation, once the Sales users might need to generate reports on the Opportunity pipeline and gain insights on future Revenue potential, or the Marketing team might need insights on potential customer behavior, which would enable them to focus on appropriate Marketing tactics.

Based on the above-defined stages, the below Requirements Elicitation Pyramid can be built,

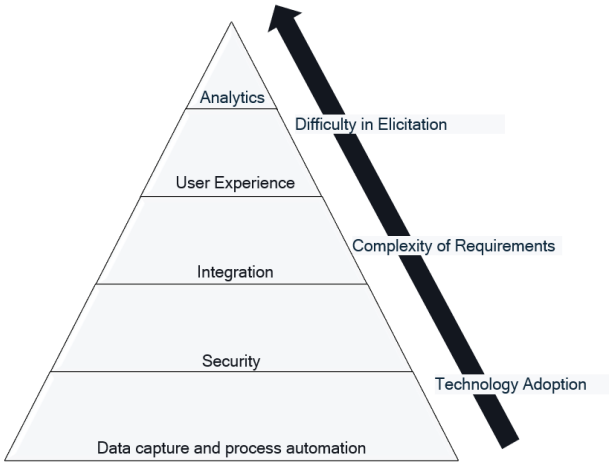

Fig. 1 Requirements Elicitation Pyramid

As we progress from bottom to top of the Pyramid, the Organization advances in Technology Adoption, and the Complexity of Requirements increases, hence increasing the level of difficulty in Requirements Elicitation.

III. CONCLUSION

Requirement elicitation is often a complex process with users not being able to articulate the exact requirements in proper order. Following the bottom-up approach from the Requirements Elicitation Pyramid would help to a great extent in eliciting the requirements from users, starting from basic to the complex requirements

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