An Insight into a Software Architect's Role in Project Development

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Abstract- Software architect plays an important role in developing the software as software architecture plays a crucial role in the positive and negative result of the software project with regard to quality and cost. People have different individual tendencies, and how they understand, design and implement any allocated task is influenced by it. These individual tendencies are identified by soft skills. Generally development of software is a team effort which implies various people performing distinct tasks. The positive and negative result stories of software projects disclosed the human factor as one of the critical importance. In this handwork we are presenting an analytic study about the practical experiences and industrial case studies on how the architect's role has facilitated or hindered success. This paper describes the results of an online survey, with the contribution of 20 software architects, targeted at defining the features of the software architect's role. The results expose that software architects conduct different activities such as duties, knowledge, skills, management and many more. Besides, in the context of leadership, software architects attempt to do far more than they can at present do. The output of this survey will help in understanding various aspects and requirements for the post of software architect and gives the present-day status of their use in job advertisements. Software architects develops software which is the fundamental part of software architecture; however, its combination in the development procedure has become more challenging with the conversion from traditional to agile development methods, and with the architects becoming more technological experts responsible for high-level design.

Keywords – software architect, project development, Risk management, ownership

I. INTRODUCTION

Software architecture is gaining increasingly attention in the software development community due to its significantly important role in overall development cycle. The software architecture provides us with the structure of the software, its components; properties of these components and their relationship with each other.The major role of a software architectis to create the software architecture. The software architect has to decide on a particular architecture by experimenting with different architectural approaches. He has to create different models and interface specification documents and validate the selected architecture against the requirements of the software. The software architect's role is also to lead and coordinate technical activities, check the development of the project. He has to communicate with the organizational management, his peers and the customer.

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II. RESEARCH MOTIVATION

Software engineering is a set of activities comprising of phases such as system analysis, design, coding, testing, and maintenance. To achieve this, a collection of different tasks have to be performed. To perform these activities, we need people with skills to perform specific activities, like a software designer to design, a testing head to test the software, since all these activities are very different from each other. Software architecture is still a young field and is still on its developing stage. The principles of the architectures are still not properly defined but it is clear that human creativity is a major requirement in software architecture. Software architecture is exploratory in nature, the architect has to look for different components and had to try out a variety of schemes so as to properly find an appropriate solution which is validated against the software requirements.

From a outsider's view, the job of a software architect looks easy, but in implementing large scale projects, its difficult to find the key components, relationships between them and then to find the appropriate architecture such that these requirements are fulfilled. There are sometimes repetitions since it takes a number of iterations to choose a good architecture. The number of iterations reduces with experience.

This is an area of interest and is still in the developing stage. This gave us motivation to do some research and make an inference on what exactly is the role of a software architect.

II. APPLYING K-MEANS ALGORITHM

The survey that has been carried out explains us that a software architect is responsible for generating or choosing the most suitable architecture for a system , such that it satisfies the business needs, requirements of the user, and attains the expected outputs under given limitations. We have considered 11 aspects namely managing risks, performance and scalability test, management skills, technical skills, knowledge, leadership qualities, ability to take risk, architecture evaluation, flexibility, interpersonal communication, to determine the views of software architects and from the survey we have concluded that the role of software architect has not hindered but facilitated success.

We have used K-means Clustering algorithm to find the similarities in the judgment of 20 software architects which serve as our attributes. We considered 11 clusters and then implemented the k-means Clustering algorithm. We implemented this using the WEKA tool.

The Lloyd's algorithm, mostly known as k-means algorithm, is used to solve the k-means clustering problem and works as follows. First, decide the number of clusters k.(Here 11) then:

1) Initialize the center of the clusters

$$\mu_i = \text{some value}, i=1,...,k$$

2) Attribute the closest cluster to each data point(the data collected from 20 software architects)

$$c_i = \{j : d(x_j, \mu_i) \leq d(x_j, \mu_l), l \neq i, j=1,...,n\}$$

3) Set the position of each cluster to the mean of all data points belonging to that cluster

$$\mu_i = 1|c_i| \sum j \in c_i x_j, \forall i$$

4) Repeat steps 2-3 until convergence Notation

$$|c| = \text{number of elements in c}$$

Name	Organisation	Managem	Technical	Knowledg	Organisati	Leadershi	Ability to take	Architectur	Interperson	Flexibility	Managing Risk	Performance and Scalability	Test
Daniel Wang	software architect , project man	4	3	4	3	4	4	5	4	4	3	3	
Rajesh Kanna	PT. 1rstWAP	4	3	4	3	4	2	5	3	3	3	4	
David Cornish	JPMorgan, London, UK	3	4	3	4	3	4	3	4	3	4	4	
Christopher Brandt	Moneris Solutions, Burnaby, BC,	3	4	4	3	3	4	4	4	3	3	3	
Craig Walters	Master Architect, Monsanto, St l	4	4	4	4	5	4	5	3	4	4	3	
Venkatesh Krishnamurthy	Valtech India, Bangalore	4	4	4	3	4	5	5	4	2	4	4	
Huub van Dijk	Independent, Amsterdam, Neth	4	3	3	4	3	4	3	3	4	4	3	
Aravind Venkat	AVP, Satyam, Bangalore, India	4	3	4	3	3	4	4	4	4	5	4	
George Fankhauser	MT, Columbus, OH, USA	3	3	4	3	4	3	4	3	4	3	4	
Donna Maskell	Raytheon, Fort Wayne	2	3	4	4	5	5	5	4	3	4	2	
Nicole Tedesco	Software architect-engineer, W	5	4	4	4	5	4	4	4	5	4	4	
Theo Gantos	TEKA, Flint, MI, USA	3	3	4	3	4	3	3	4	3	4	3	
Conrad Roche	Applications Architect, Cognizar	4	3	3	4	3	3	4	4	3	4	4	
Mayank Sugandhi	Pyxis System, Pune	3	4	3	3	4	4	4	5	3	5	4	
Stefan Grasmann	Microsoft, ZÄNhlke, Eschborn, G	4	4	4	4	3	3	3	3	4	3	3	
Murugesan R	Technical Architect, Genisys Sof	4	3	4	4	3	4	3	4	5	3		
Peter Pavlovic	JPMorgan, New York	2	4	4	3	5	4	4	3	3	4	3	
Durga Srinivas Gudimetla	Tata Consultancy Services, Hyde	3	3	4	3	3	3	4	3	4	2	4	
Moonesh Kachroo	technical Manager, WNS, Gurgai	4	4	3	3	4	4	4	3	3	4	3	
Victor Alejandro Baez Puente	Grupo Nacional Provincial	4	4	5	3	4	4	5	5	5	4	3	

Figure1. Data collected represented in an excel sheet

A software architect scans an organization's universal business and initiates the working of the software, estimates new software applications to verify whether they are apt for an organization and if the present hardware will support them. A brief information regarding advantages and costs of software is given by software architect to make sure that it will provide the user over long run. He does this by abstracting the problem of a system into a controllable model that defines the nature of a system by revealing key details and remarkable constraints. Maintaining control on the architecture process along with the project's software development process is also a key task.

The architect needs to have a good contact with management at different levels, stakeholder groups, , business analysts or marketing, and developers. The architect needs to balance active contribution with the necessity to generate conceptual integrity and keep the architecture decision procedure from stalling. Knowledge about compilers and different language translators can identify the costs for changing computer programs from one language to other, so the software architect selects the language and the environment.

Leading a team of programmers is a major role of software architect. Negotiating outsource contracts for creating new software, building various prototypes of the software and testing them, transferring previous data from existing software to new software, testing and reviewing the new software and solving the problems are also some of his roles. Training manuals are developed by software architect and they also run training sessions to give the users details about the use of the software

II. THE COMPARATIVE

After going through various matrices namely management skills, technical skills, organizational support, leadership qualities, performance and scalability, architecture evaluation, flexibility, managing risks, interpersonal communication and ability to take ownership we can easily say that all the above mentioned factors are more or less equally responsible for the role of the software architect. The following figures – Figure 2 show the different ratings given by various software professionals and architects. Figure 3 is the summary of all skills.

Management Skills

Technical Skills

Knowledge

Organisational Support

Leadership Qualities

Ability to take ownership

Architecture Evaluation

Interpersonal Communication
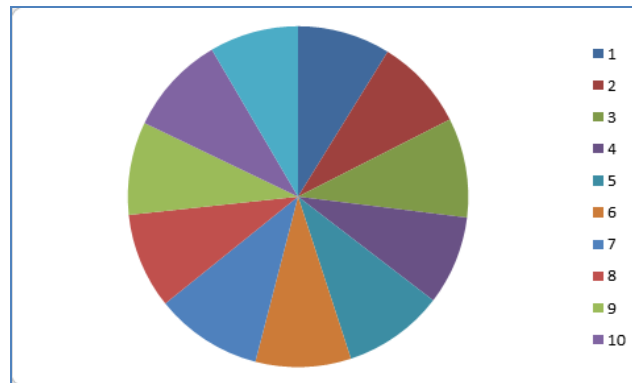
Figure 2. Ratings on different skills

Figure 3. Pie Chart representation of the required skills

It is important that new systems are built in a way that best ensures that functional requirements are met whilst also ensure that service qualities (Performance, scalability, extensibility etc.) for now and for the future are achievable. Review and improve on existing systems, making use of new technologies and methodologies to seek continual improvement for existing systems is required. Provide high level guidance and direction on project work, making sure that new projects fit in with an overall strategic vision. Provide clear guidance on project requirements. Provide a clear business strategy; and most importantly provide training to allow architects to stay up to speed with new technology developments. After doing all the statistical analysis through graphical means and through the k- means application of data mining we can say that management skills and leadership skills are the most important skills required for a software architect.

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