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Application of Quantitative Research Methods in Identifying Software Project Factors

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ABSTRACT

Software projects have no choice than to succeed and the achievement of success requires a huge effort to ensure that a software process is mature enough to yield a product that is not only trustworthy but according to the requirements of the user. This paper is based on a survey that identifies the factors that when capitalized on may ensure that the project is completed successfully. The paper then, as a result provides a list of project success factors and provides the statistical evidence to support the result of the survey.

I. INTRODUCTION

In a recent study the most common software project success factors were also identified [1]. The process of identification spans over the literature survey that spans across the valuable literature available in the domain. It is important to note that there exist quite a few project factors that are critical enough to be considered. The emphasis and order given on their handling may strongly build or disturb the flow of software development and the ultimate product to be delivered. The identification of the project factors that determine the success or failure of the project is huge. A literature study was conducted in this regard to identify the most common project factors.

Barry Boehm has discusses that there are four basic variables required in the estimation of a software project [3] , namely software size computation, effort estimation in person hour, cost and budgets calculation and recourse allocation. The author has also mentioned that the COSMIC-FFP as international standard in software estimation.

The authors (Josian, Abraham) have mentioned that there are only three valuable factors in any successful projects to be considered, cost, effort and quality. The author has also proposed SMART techniques to make a project successful [2].

Based on the literature, a survey is prepared to help us identify the possible project success factors. The users may agree or disagree to already proposed success factors and they can propose the factors by themselves as well which are highly considered.

II. METHODOLOGY

- **Survey Question:** The survey demonstrates seven project factors and five choices on a likert scale [4] to be chosen from. The seven project factors presented in this survey include 'Hardware resources', 'Requirement change', 'Availability of reusable code', 'Time', 'Cost', 'Team size' and 'Need for documentation'. The question is presented in Fig 1.
- **Survey Design and Conduct:** Considering the scale of the survey this is inevitable to include as many individuals as possible to confirm a solicited response and have the strong validation [5]. It is however notable that the responses have to be precise and should come from the experienced users. In order for this the following means are used to spread the survey and collect the response.

Measure	Number
Confidence Level	95%
Confidence Interval	4.76
Population	*
Population accessed	300
Sample Size	169
percentage	50

Table 1: Statistics used to calculate population size and sample size

The Survey reached to 240 Individuals directly, while three groups of software risk management and project management were also included in the survey having average size of 20. It can therefore, be argued that the survey link and information was sent to 300 respondents to be able to respond. Following statistics are used for this survey.

III. SURVEY RESULTS

The survey as we identify, is responded by 176 respondents containing the professionals of highest academic and industrial caliber. Inorder to see that if the project factors can be accepted or rejected a threshold value is determined to be 4. Results are shown in table 3.

As having an acceptance ratio of 80% is considerable, on a scale of 5 it is believed that 4 is a suitable level to decide that if the factor can be accepted or not?

No	*Project Factors*
1	Computational Resources
2	Requirement Change
3	Availability of reusable code
4	Cost
5	Time
6	Team Size
7	Quality Focus

Table 2: Average weighted response for each project factor

Therefore, as a result of this survey, the project factor's list consists of the following table.

IV. PROJECT FACTORS

- **Computational Resources***:* Computational resources cover both: hardware and software needed to develop the Software system. The hardware resources include but are not limited to the computers, printers, networks, stationery and bandwidth while the software needs generally cover the licences for authentic software and the training on them. The hardware platform has drastically changed in the previous few years. Larger projects need more hardware resources to be utilized for the purpose of development.

- **Requirement Change:** Requirements about software define what is to be developed, and provide a basis for the structure of software that is to be built on that. The accurate requirements increase the probability of success for the software under consideration and the changing requirements improves the chances of failures.

  Large projects have an involvement of huge financial and technological recourses and should the requirement not gather completely the problems later may be drastic financially and technically as well. The loss is of same level in small projects but as there are less finances and technology involved it may not be that visible and may not dent the growth of the firm as it may do for the large projects.

- **Availability of Re-usable Code:** With the orientation of Object Oriented Programming (OOP) the concept of reusability came into being. The availability of re-usable code helps the development effort by multiple ways. It not only decreases the development time and effort but also reduces the time spent on testing the software component.

  If a required component is not available from within the organization it is observed that if the component is available from online stores, the commercially available components are called COTs [115]. If the COTs is also unavailable the component is developed and placed in the stores for the future use. Component assembly model is proposed for such requirements.

- **Cost***:* The total cost required to develop a product, including the cost of human resource, technological resources, environment, tools, technologies and risk management. Being the key development component a huge portion of the cost is spent on the salaries and other benefits of the employees.

- **Time:** Development time required to develop software or the component, and has a high impact on the definition total cost of the softwre; time is governed by the size of the problem under consideration and also the available resources that can be used to work on a problem.

  Time is one of the most important characteristics to declare a project successful if it is completed in time.Effort in person month is a yardstick to measure the time needed to develop a project by a single programmer. The EPM measure describes that how many human resource is required to be deployed for the execution of a project. If a project can be completed by four team members in 4 months, the project is said to have EPM of 16.Smaller projects possess lower EMP.

- **Team Size:** The number of team members assigned to execute a specific task (generally the complete project). The team consists of the specialized personnel who work in any specific domain, sometimes a team is considered specialized in all domains and is assigned all tasks from analysis to deployment of the software, its rare in medium and large projects but highly likely in the small projects with small budget. Large scale projects generally enjoy the liberty of having separate teams or team members to execute each phase of the SDLC.

- **Quality Focus:** The amount of quality focus required addressing each project, despite the fact that quality is a default focus in any project some specific projects need really high quality focus, and ample amount of time is used for this purpose which is only affordable in large projects.

V. CONCLUSION

It can be concluded that this study has been successful to help identifying the software project success factors. A quantitative methodology has been used covering wide number of responses. The threshold value is determined from the responses and the evaluation mechanism has been developed for accepting or rejecting any project factor.

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AUTHORS PROFILE

Basit Shahzad received his MSc (Computer Science) from Hamdard University and MS (Software Engineering) degree from NUST. Now he is a PhD student at the Faculty of Science and IT in University Technology PETRONAS, Malaysia. His area of research is in Software Engineering and Information Systems.

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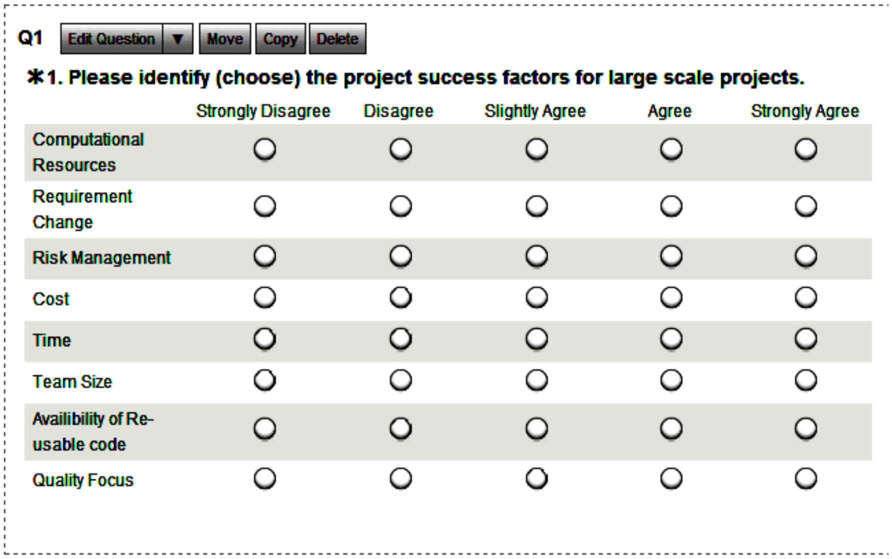
Figure 1: Survey Question Design



✱1. Please identify (choose) the project success factors for large scale projects.

	Strongly Disagree	Disagree	Slightly Agree	Agree	Strongly Agree
Computational Resources	○	○	○	○	○
Requirement Change	○	○	○	○	○
Risk Management	○	○	○	○	○
Cost	○	○	○	○	○
Time	○	○	○	○	○
Team Size	○	○	○	○	○
Availibility of Re-usable code	○	○	○	○	○
Quality Focus	○	○	○	○	○

Answer Options	*Strongly Disagree*	*Disagree*	*Slightly Agree*	*Agree*	*Strongly Agree*	*Weighted Response*	*Average Weighted Response (AWR)*
Likert Scale	x1	x2	x3	x4	x5		
Computational resources	1	20	57	304	350	730	4.15
Requirement Change	3	14	84	200	440	741	4.21
Availability of reusable code	3	10	75	320	315	723	4.10
Cost	0	16	33	280	435	764	4.34
Time	4	6	12	248	515	785	4.46
Team Size	2	10	72	232	435	751	4.26
Need for Documentation	8	16	45	248	415	732	4.15

Table 3: Average Weighted Response