

## A Survey on Case Tools Adoption for Requirement Management in Pakistani Software Industry

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**Abstract:** Introduction of modern technological applications in organizational settings enhances the productivity and efficiency of employees. Similarly, use of computer aided software engineering (CASE) tools can improve the software development process. Since technology adoption is varied among different geographical regions of the world, so it is scientifically interesting to understand technology adoption practices in different communities. In this paper we examine the impact of adoption of CASE tools for management of requirements at three different software companies in Pakistan. In order to gather empirical data a questionnaire was developed and floated among employees of those companies.

**Key words:** CASE tools • Requirement Management • Requirement Engineering

### INTRODUCTION

Computer Aided Software Engineering (CASE) tools facilitate activities during software development process. As a result increased productivity and improved quality is targeted. CASE tools can vary in their functionality from a single editing application supporting in documenting requirements to a complex set of tools facilitating in requirement elicitation to code writing.

Use of CASE tools has been extensively discussed in software engineering literature [1-6]. Temponiet *et al.* [7] described a CASE tool STAR in their study, where, participants in software team can communicate their thoughts using House of Quality (HOQ) framework. It was used to discover and analyze association between different viewpoints of a requirement. Authors presented an extension of HOQ framework based on Fuzzy logic that captured vague requirement and provided communication among team members on that requirement. Mahdyet *al.* [8] described the benchmarking of CASE tools and emphasized that user should select that tool which fulfills their needs.

Since software development process is quite complex and realizing a high quality application is a tedious process [9, 10]. Requirements engineering is one of those complex tasks. In requirements engineering process

dealing with functional and nonfunctional requirements is a complex process [11, 12], so in this paper we wanted to explore how CASE tools are being used in Pakistani software industry for requirements management.

A survey was conducted to analyze the importance of CASE tools for requirement management. A questionnaire was prepared and distributed among technical staff of different Pakistani organizations. Results were compiled on the responses gathered from these respondents. Each question had three options Yes, No and Don't Know. Organizations that were selected for survey were Ufone, IBM and Ciklum.

**Empirical Study:** In our questionnaire (available in Table 1), first question was about the importance and role of CASE tools in software requirements process. The responses showed that 93% of respondents agreed that case tools play a vital role for software requirement process. Only 2% people disagreed and 5% of respondents didn't know the importance as shown in Figure 1.

Gathering requirements is an important activity in requirement engineering process and later software development activities depend on the correctness and completeness of requirements. CASE tools can help in many ways in requirement gathering like prototyping etc.

Table 1: Sample questionnaire

Questions	Yes	No	Don't Know
Q 1. Are case tools important for software requirements?			
Q 2. Do they help in software requirements?			
Q3. Do they improve productivity?			
Q4. Does the use of CASE tool decrease the requirement elicitation time?			
Q5. Do they effect the documentation of software development process?			
Q6. Do they help in understanding the goal of software being develop?			
Q7. CASE tools are used uniformly in all organization?			
Q8. Do they help to categorize the requirements?			
Q9. CASE tool helps to communicate with the customer?			
Q10. Do the use of case tool effect the quality of the software being developed.			
Q11. CASE tool eliminates mockup requirement in your organization.			
Q12. CASE Tool identifies the dependencies of requirements.			
Q13. CASE tool improves the traceability.			
Q14. Is CASE tool helps to manage the Change Management?			
Q15. Is CASE Tool managing the release process activity in your organization?			

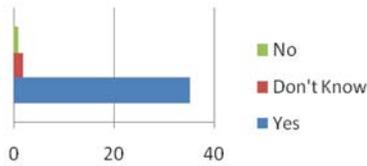


Fig. 1: Importance of CASE tools

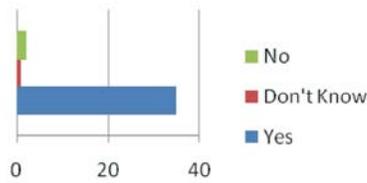


Fig. 2: Importance of CASE tools in requirement gathering

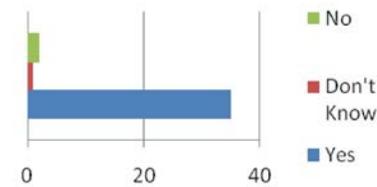


Fig. 3: CASE tools increase productivity

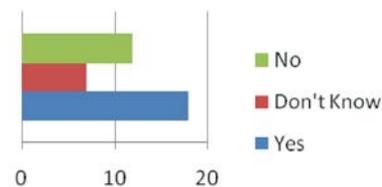


Fig. 4: Reduction of time in requirement elicitation

In our survey 94% respondents described that CASE ools helpthem in requirement gathering activity, while 4% disagreed and 2% of respondents didn't have any idea about this, as shown in Figure 2.

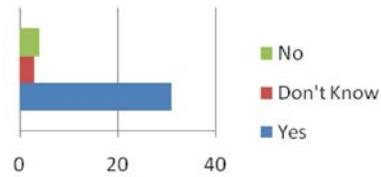


Fig. 5: CASE tools supports software process documentation

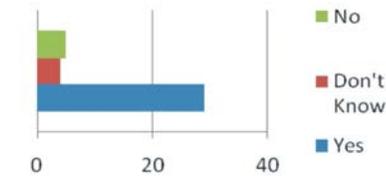


Fig. 6: CASE tools assistance in understanding software goal

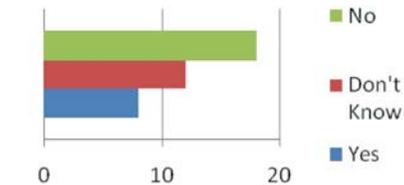


Fig. 7: Uniformity in use of CASE tools in organizations

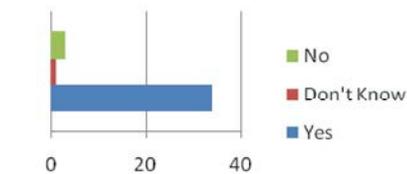


Fig. 8: CASE tools help in categorizing requirements

One of the advantages of CASE tools is to increase the productivity of software. In our survey 97% respondents agreed that CASE tools

increase productivity, 2% disagreed and 1% didn't give any response, as shown in Figure 3.

Requirement elicitation activity plays a vital role in software development and needs sufficient resources and time. CASE tools can decrease the time needed for elicitation process. In our survey 45% respondents agreed, 30% disagreed with this, however 25% respondent didn't know about this facility of CASE tools, as shown in Figure 4.

Documenting software sub-processes is an important part of development life cycle. We tried to capture the responses on the support of CASE tools provided for documentation. In our survey, 88% respondents agreed that CASE tools help in documentation process while 7% disagreed, only 5% selected don't know option, as shown in Figure 5.

Understanding goals and objectives of the software to be developed is inevitable for each and every development team member. CASE tools also try to assist in understanding goals and purpose of software applications. In our survey 75% respondents agreed that CASE tools help in understanding goals, whereas 10% disagreed and 15% didn't have any idea about this, as shown in Figure 6.

Next we tried to analyze the uniform usage of CASE tools in all organization. In our survey 20% respondents agreed that organization use CASE tools while 45% disagreed with this and 30% didn't give their response, as shown in Figure 7.

Categorizing requirements into functional and nonfunctional requirements is important for development perspective. CASE tools can help in this categorization. In our survey 90% respondents agreed that they are getting the help of CASE tools in this process, 6% disagreed and 4% chose their option as don't know, as shown in Figure 8.

In order to acquire feedback from customer, communication with customers is vital during requirement engineering process. CASE tools can provide assistance in communication with customer. In our survey 60% respondents agreed to this, 27.5% disagreed and 12.5% didn't have any idea about this, as shown in Figure 9.

CASE tools attempt to improve the quality of software. In our survey, 65% respondents agreed that CASE tools help in improving quality, 20% disagreed and 15% respondents remained neutral, as shown in Figure 10.

In order to save resources, mockup requirements should be eliminated during requirements engineering process. In our survey, 50% respondents agreed that

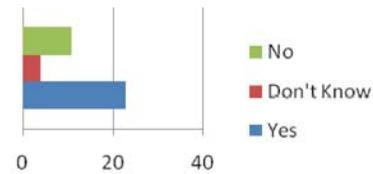


Fig. 9: CASE tools support for communication with customer

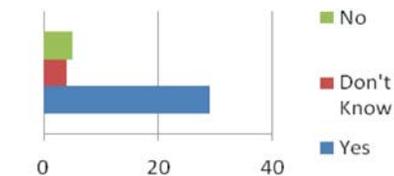


Fig. 10: CASE tools improves quality

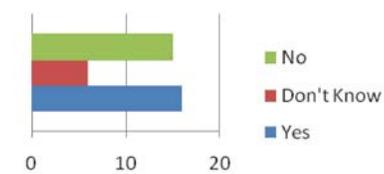


Fig. 11: CASE tools eliminates mockup requirements

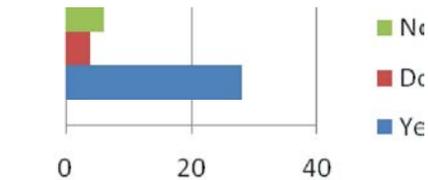


Fig. 12: CASE tools identify dependencies in requirements

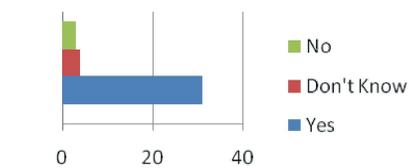


Fig. 13: CASE tools help for requirement traceability

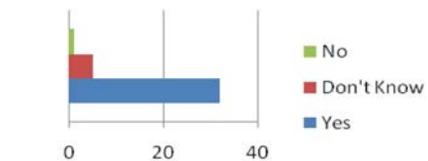


Fig. 14: CASE tools support for change management

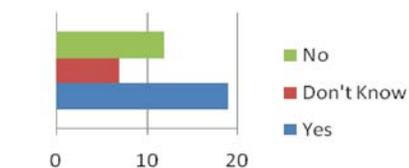


Figure 15: CASE tools assistance for release management

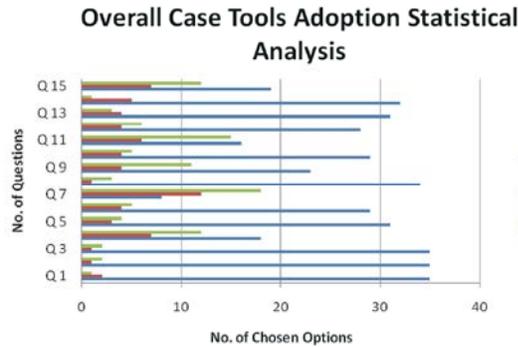


Fig. 16: Overall response of three organizations about CASE tools

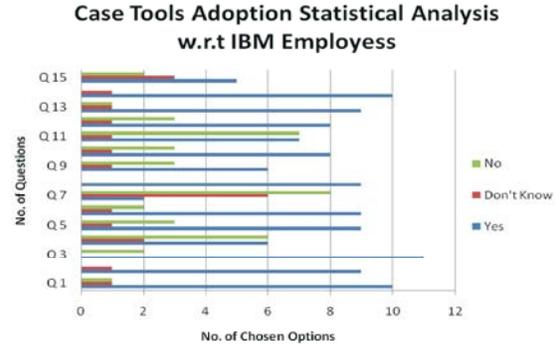


Fig. 18: Responses of IBM Employees

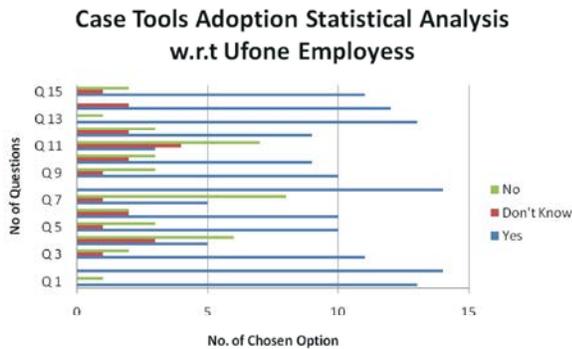


Fig. 17: Responses of Ufone Employees

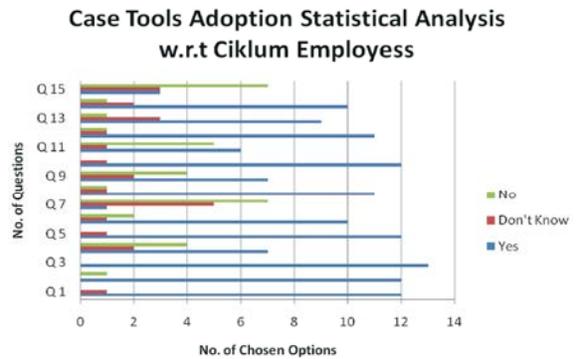


Fig. 19: Responses of Ciklum Employees

CASE tools help in elimination of mockup requirements, 30% disagreed and 20% didn't know anything about this, as shown in Figure 11.

Identifying dependencies among requirements is vital in requirement analysis. CASE tools try to help in identification of dependencies as well. In our survey 70% respondents agreed to this, 20% disagreed and 10% remained neutral, as shown in Figure 12.

Requirement traceability is also very important in requirements engineering process. CASE tools can support traceability of requirements. Our survey showed that 70% respondents agreed with this, 10% disagreed and 15% didn't have any idea about this, as shown in Figure 13.

Changes are inevitable in software process and there should be effective change management procedures in place to effectively manage change requests. CASE tools can also provide assistance in fostering effective change management process. In our survey 72.5% respondents agreed with this, 5% disagreed and 22.5% respondents give response as don't know, as shown in Figure 14.

Release management is also an important task during software development. CASE tools try to help in release management as well. In our survey, 45% respondents

agreed that CASE tools provide assistance in release management, while 30% disagreed and 25% didn't have any response, as shown in Figure 15.

Figure 16 illustrates the overall analysis of three organizations, total number of respondents was 38, Y axis represents 15 questions about CASE tools, X axis represents total number of chosen options that could be "Yes", "Don't Know" or "No" and each colored bar is representing chosen option e.g. Green is representing "No", red representing "Don't Know" and blue representing option "Yes".

Analysis of survey represents that all three Organization vote in favor of adoption of CASE tools for software development. Similar brief statistical analysis of each organization is shown in Figure 17, 18 and 19.

## CONCLUSION

Results from survey conclude that using CASE tools is vital in requirements engineering process. Organizations using CASE tools perform more efficiently and effectively and organization working without CASE tools lag behind in software development. Pakistani software industry is not so mature and with the passage

of time these practices will get mature. Secondly Pakistani software industry mainly relies on outsourced projects where requirements are well defined by their counter parts in developed countries, which also undermines the importance of an effective requirement engineering process. In our survey, we found that one of the major reasons of not using CASE tools in software process by Pakistani industry is cost and licensing. In this situation indigenous CASE tools may help in lowering the cost.

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