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An Empirical Study of COTS components Persuasion, Evaluation & Selection and Integration in software houses Faisalabad, Pakistan

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Abstract

Under development countries (UDCs) like Faisalabad, Pakistan where information technology benefits are not yet fully utilized due to lack of resources and very old infrastructure. Selecting suitable commercial off-the-shelf (COTS) is the most critical phase in COTS-based software development. However, in research, numerous problems are faced during the COTS evaluation, selection and integration. All these major causes are due to the lack of familiarity about COTS products, the unawareness of the available number of methods for COTS evaluation, selection, integration and deployment phase, and the deficiency of supervision for selecting between these best methods for COTS evaluation and selection. In this research work, a closed questionnaire method was adopted to evaluate the user's perception about COTS evaluation, selection & integration in software houses and IT Professional in Faisalabad, Pakistan. The results of this work will contribute towards a framework development for COTS evaluating and selecting, integration.

Keywords: Under development countries, Commercial off-the-shelf, COTS-based software development, COTS Evaluation and Selection, COTS Integration.

1. Introduction

The diffusion of computer technology in UDCs is at developing stage. A variety of factors like lack of familiarity about COTS products, unawareness of the available number of methods for COTS evaluation, deficiency of supervision and unskilled new technologies are act against the COTS evaluation and selection and its integration [1]. COTS component (also known as general products, shrink, compiled product, secure and commercially affordable component) that can sold as tradable products (purchased from a vendor, distributor or store) for all classified computers including mainframes, workstations and microcomputers are compatible for different platforms like windows, Linux etc. Performing good COTS component selection plays a precarious role in the success of the ending product [2]. COTS selection is the procedure of determining the fitness-of-use of COTS components in a new perspective, and then selecting more than one component with the maximum fitness [3, 4].

Component Based Software Development one of major area deals with the development of using COTS component. As the scope of a software system increased, new methodologies of software development come to the market. These methodologies contain the object oriented programming, Feature Driven Development, Extreme Programming, Agile software development COTS-Based programming and Aspect Based programming etc. These approaches provide a better view to present and develop a software system. These methodologies are very much inspired from the real world and provide a systematic and quick software development approach. [5]

In software development a good framework is combination set of software artifacts (such as statements, classes, objects, and components) that work together to provide a reusable architecture of related applications. Frameworks can be a very significant means to decrease overall software development cost and improve its quality, it can be

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hard to understand, select, learn, use, debug, and optimize.[6,7]

2. COTS Evaluation Techniques

COTS evaluation cannot be determine during the software development process because efficient software always depend upon fitness of COTS product. Evaluation of COTS components needs some basic information as pre-requisites. These pre-requisites will help to judge the evaluation of COSTS [8, 9]. COTS products are evaluated on the base of stakeholder's functional and non-functional requirements. Kontio *et al*. [10] advised hieratically base COTS evaluation technique, in which goals refined according to application requirements and architecture, the COTS capabilities, etc. Maiden *et al.* [11] agrees with Kontio and recommended for evaluation at same time at given COTS selection. Three strategies that can apply to evaluate COTS products [12, 13].

2.1 Progressive filtering

Progressive filtering is a plan whereby a COTS component is selected from a larger set of pole, in which component that do not fulfill the evaluation criteria are progressively removed from the given components list.

2.2 Puzzle assembly

Suppose that COTS is like puzzle pieces. This means a COTS product feels bets fit when not integrated but fails to integrate. This shows COTS should be considered in isolation as well as in integration scenario [14].

2.3 Keystone identification

In keystone plan, components are assessed against a key point characteristic such as a vendor selection or type of new technology. [13].

3. COTS selection approaches

A variety of approaches available like (off- the-shelf option OTSO, procurement-oriented requirements engineering PORE and social-technical approach to COTS software evaluation STACE) for COTS components selection. These approaches have been developed by aimed at addressing problems associated with COTS component selection. Different approaches are of different effectiveness and might be suitable for different contexts shown as figure 1.

COTS Evalutaion & Selection			
Sr No.	Approaches	Year	Evaluation
1	OTSO	1995	PF
2	IusWare	1997	Any
3	PRISM	1997	PF
4	CISD	1997	PF/PZ
5	PORE	1998	PF
6	CEP	1999	PF
7	STACE	1999	KS/PF
8	CRE	1999	PF
9	CAP	2000	PF
10	CARE	2001	PF
11	RCPEP	2001	PF
12	PECA	2002	Any
13	BAREMO	2002	PII
14	Storyboard	2002	KS/PF
15	CS	2002	PII
16	i-MATE	2002	PF
17	WinWin	2003	PF
18	Erol's	2003	PII
19	DesCOTS	2004	PF
20	Agile	2005	PF
21	MiHOS	2005	KS/PF
22	CSSP	2011	PF
23	UnHOS	2011	PF

PF: Progress Filtering
KS: Keystone
PZ: Puzzle assembly
PII: Partially, informally, or implicitly satisfies the criterion

Fig. 1: COTS Evaluation and selection approaches [14]

4. Methodology

The evaluation is carried out from software houses and IT professional in Pakistan by using an automated assessment tool.

There were numerous data collection approaches for survey strategy such as questionnaire, self-completion, structured observation, and interview [15]. We used self-completion questionnaire approached to collect data for this study due to some reasons such as: cost effectiveness, easy to scrutiny data, support a high degree of confidentiality, and coverage an extensive area [16].

The study was conducted in four core phases:-
1. Questionnaire design
2. Data Gathering
3. Data analysis and results

Before applying the actual survey, this study conducted a pilot survey that involves only 50 numbers of respondents.

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4.1 Questionnaire Design

A survey method was implemented because the aim of this study was descriptive. So self-completion questionnaire was developed originated on the literature on CBSD and Awareness COTS component. The questionnaire designed included thirty two questions and closed-end questions. The online survey and closed-end questionnaires were used as the instrument for gathering data and also multi responses questions and yes/no questions were used.

Table 1: Design Questionnaires Categories wise

No	Cat.	Statements
1	Awareness of COTS	Do you know COTS component.
2		Do you know the benefits of COTS component?
3		Do you know why we use COTS component?
4		Is the COTS Component easiest methodology for development?
5		Does reliability issues occurs due to integration of COTS components
6		Is the COTS helps to design interactive application for user?
7		Does a COTS based solutions fulfill your requirements?
8		Does an in-house development is more suitable than a COTS based development.
9		A new COTS Components releases can arise a version compatibility issue.
10		Requirements must be clear before to buy the COTS components.
11	COTS Evaluation & Selection	Do you know about the COTS evaluation strategy?
12		Do you know about the selection Technique for COTS?
13		Is there any uncertainty in COTS Selection?
14		Selected technique fulfills the Stakeholder holder's requirements?
15		What do you means Non-functional requirements can affect the COTS Selection process?
16		Functional requirements can affect the COTS Selection process.
17		The availability of products has an impact on COTS selection process?
18	Vendor Selection	Before purchasing the COTS Components are you agreed with vendor based market
19		Customer support services are an important aspect for the selection of Vendor?
20		Is vendor providing the COTS component within allocated budget?
21		Will COTS vendor provide adequate software documentation?
22		Do you believe that in purchasing COTS, your vendor must provide warranties and claim policies?
23		Are you agreeing geographical location of vendor is important issue?
24		Is there support (training, developer, etc.) offered
25		Vendor financial stability also important for purchasing a COTS component?
26	COTS Integration	Do you think COTS component can be used in Critical Software?
27		Software Failure due to COTS components.
28		Using COTS, customers have less control over software functionality and support.
29		Prototyping (evaluation technique) may reduce the risk of error more than testimonials.
30		Does a security issue arise in using COTS components?
31		COTS Component consistency with other equipment/interfaces at integration time.
32		COTS integration effort would be significantly complex, taking more time, effort, and money than custom based development

4.2 Data Gathering

Using pilot or pre-test survey was great benefit before conducting a full study [17]. The pilot survey should be managed to small group of respondents who are alike as possible to the population study. A pilot survey is an extra measure that can be taken to exploit the effectiveness of a survey.

4.3 Data Analysis and Results

After collection of data were coded and entered in Microsoft Excel for analysis. Percentage method was used to different categories [18].

5. Results and Discussion

The respondents were asked about knowingness COTS component that being used by their in-house development. The survey indicated that 30% of the respondents do not know about COTS while 70% ranged that well know about COTS components Fig. 2.
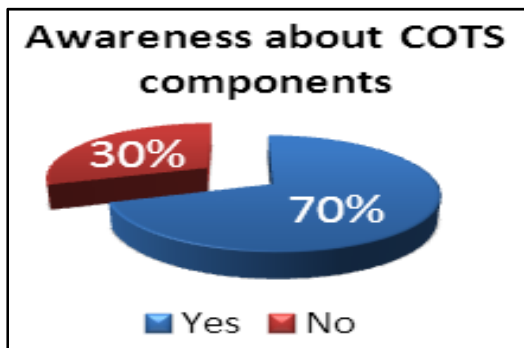

Fig.2: Awareness of COTS

Total respondents were 50 where 35 respondents said YES they know about the COTS and 15 respondents said they do not know about the COTS. The remaining questions were asked from the 35 peoples.
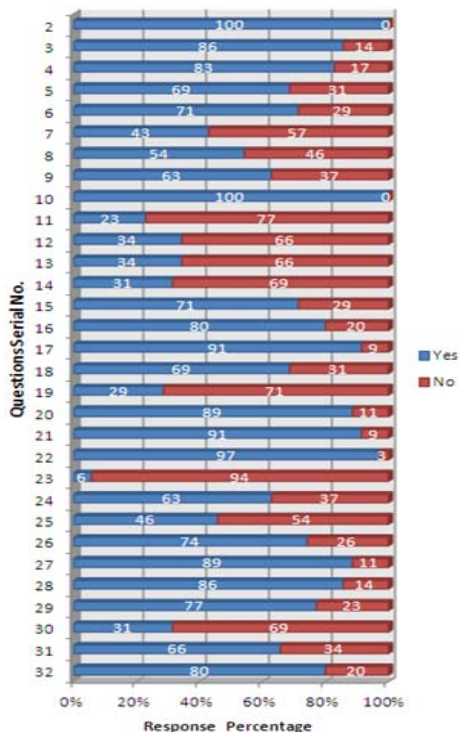

Fig.3: COTS selection activities and attributes used by UDCs for parasitize COTS selection attributes

Fig.3 shows that overall results of 35 respondents. The users have to answer the question as per value they perceived from the give criteria.
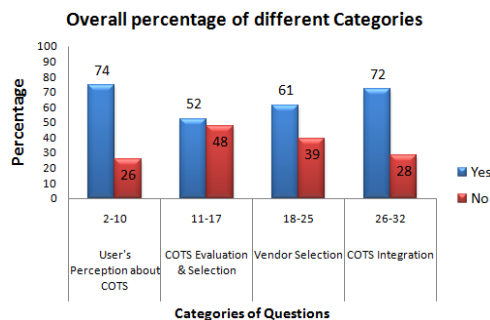

Fig.4: COTS overall percentage of different categories

While evaluated the results by given categories Fig.4, it was found that 74% users are agreed about the asked statements and 26% users don't agree on statements. While assessment the COTS evaluation and selection category 52% are agreed about asked statement and 48% do not agree. On vendor selection category 61% are agreed about asked statements while 39% do not agree. Finally about COTS integration 72% are agreed on asked statements while 28% are disagree.

6. Conclusion

The purpose of this study was to scrutinize and evaluate the current practice of evaluation and selection of COTS components from software houses and IT professional in Pakistan. The verdict shows that the majority of respondents did not use any criteria that published in literature for evaluating and selecting COTS components. In given statistical data, the study shows that they evaluate and select COTS components based on the experiences of development team and the experience of IT manager. Therefore, the findings of the pilot study related to the parasitize COTS selection attributes that used during evaluation and selection process. It also benefits and risks of using COTS components will be used for building framework for evaluation and selection COTS. This framework will fill the gap between state-of-art and state-of-practice and reduce the incredulous problems in current COTS Selection methods. In future work the author will try to discuss the environmental factors that affect the implementation of this framework.

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