



How to Select Best Possible Software Tools in Software Organizations “A preliminary stride to ameliorate Software Quality Process”

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Abstract: Currently, technologies are improving on a daily basis and inclined towards meeting specific requirements of customers. The companies using technologies or tools must adapt themselves to these developments. This is critical factor as it lends support for company to reach its goals. For that, they must select a new software or tool to augment business processes. However the process of suitable tool selection is a very difficult task. Selecting the right software tool is one of the most important decisions taken by company; the success of the company will depend predominantly on it. Moreover it is hard to recognize which tool is most appropriate. This paper focuses mainly on the selection process of tool, most important steps which have to be considered while planning to select tool and other intricacies concerned with choosing most appropriate tool.

Keywords: Requirements; Development ; Collaborations; Co-operation ; Procurements ; Mitigations; Monitoring ; Software quality; Analyzing risks; Cost operations.

I. INTRODUCTION

Prior to choosing a tool, an organization / company have to consider several aspects such as; why do we need this tool? How are we going to use it? The primary grounds influencing these issues are either requirements of company or goals set by the company.

According to Gartner Research Inc., “more than 40% of the entire project effort takes place in the discovery phase” [8]. Therefore gathering requirements by a company is one of the most imperative factors the company believes in consideration when choosing or buying a development tool. Therefore, it is essential to be aware of the characteristics the tool possesses and must have in order to fulfill goals. As soon as company identifies what kind of development tool it needs, it can focus on others aspect concerned with tools such as usability of tool and expertise on tool. Firstly the usability: if the company uses a new tool, then essentially the tool should be easy to install and easy to use. In case of not meeting these requirements, lot of time will be wasted in making arrangements to formal training to employees.

Secondly, gain expertise in usage of tool. This depends on two factors familiarity over tool and functional capability of tool. The employees of company can be made familiarized by facilitating formal training sessions over tool. Similarly, the company should also concentrate on the functional aspects of the development tool. This factor can be associated with requirement of the company, which depends on how the company will use the tool for achieving their requirements. The tool should offer the necessary widgets the company needs or at least, should provide a convenient means to extend widget set. In addition, the ease with which the development tool can be used must be given higher priority. Otherwise, it might lead to undesirable results such as increase in expenditure for training employees to use the tool. Another significant factor which can steer company to

gain competitive advantage is the flexibility of the development tool. Currently, technologies are continuously varying to serve the requirements of potential users of the tool. Thus it is important to get a tool which can be configured with needs of users and adaptable with newer technologies. For instance, a company producing tool to support multiple programming languages and supporting different systems on integrated network. The first and foremost aspect company should consider is to understand needs of customers and then selecting appropriate development tool, which can address changing requirements of potential users of tool.

The portability of tool also plays a crucial role in selecting a tool. The main concern while dealing with portability is either isolating platform-specific code or with the frequency of the new versions. In fact, the company must evaluate the easiness to port the interface between the platforms which are supported by the tool. The community support for the tools is also regarded as key factor to choose the tool, as it provides additional support for tool which may or may not be covered in company tool training sessions. A tool's support includes documentation, training and others materials provided by the vendor. The documentation can be considered better if it is oriented towards user and is well written with illustrations.

The company has to know if any support is available through online community portals or a technical assistance through online chats or via telephone in case of needed help. Other point to check is the frequency with which tool is updated with new versions. Indeed, the longer the frequency is, the better it is for a company, as it won't necessitate updating the tool every year or every month which might be expensive. However, the frequency should not be too long. Eventually, the company has to find a right balance for the frequency which stays an important factor. The cost is another important and the last factor for the company. It has

to consider all the costs associated with usage of the tool, which includes: the license, the methods of procurement, the initial investment cost, the recurring operating cost, like the maintenance, and training cost. The license is important, as the company has to be aware of the license schemes and license fees associated with tool usage. However, the cost is a relative criterion. In fact, the cheapest tool may not necessarily mean that it is most awful and in contrary, the most expensive tool is not inevitably the best. The company has to study every tool available in the market and then try to find the best quality-price [1]. However, instead of reading or learning some distinctiveness of the tool, the company should study articles on related tools and most importantly; gathering feedbacks from users who have used the tool.

Firstly, to know the best available tools existing in market, the company has to examine to see which are still available and which are the most liked on the market. For this, company has to go through several articles, reviews or comparisons performed by other users or professional reviewers. However, comparisons must be only considered from experts or acceptable sources. It means that it should be information sources or articles from well-known specialists from industry. Apparently, these articles should not be too old but the more recent they are, the better it is in assisting the company to choose the good development tool it needs.

The first thing the company must do before even thinking about the market is to make inquiries with their employees about needs and kind of tools which can aid their work. These questions will help the company to evaluate which kind of development tool the future user's need [1]. Thus, a first selection could be done which will make the work easier to the company. The company has to know the opinions of the employees since they might have other information which can be useful in the selection of the development tool. For instance, Company's experience with previous projects should assist them to know which tool is similar and better to serve the purpose. Apart from this, they can also take guidance from vendors who provide the tools to company.

Presently, nearly 100% of all companies in the development business need to consider procuring development tools. Even the companies, which develop their own tools, must make this decision based on the benefits of making their own versus possibly buying and using tools created by someone else.

IT companies /organizations often choose tools that look exciting rather than having a long process in selecting the right tool. Getting together a group of companies, one can pool together the experience from using different tools and from this we can distinguish which tools are most effective for which tasks. This would then give the members of the group a better foundation for selecting the best tools. The cooperation from small and medium sized companies in the field of research and development were investigated by Kuhlmann [1]. This was based on 331 replies to their formulated questionnaire as well as 40 personal interviews, the main motive for cooperation on R&D with a third party was found to be "*the entry of a company into a completely new area of technology*" [1]. Comparing this reason with the problem posed in this paper, one can claim that selecting a new development tool for a company can range from just doing minor changes to existing project or can be new untested setting. Gartner Research Inc. states that, "Organizations that had the most-successful BPM initiatives spent more than 40 percent of the initial project time on process discovery. Establish core team responsibilities, select the right tools and use an iterative

method to create a process model that supports ever-changing business conditions" [9]. It should therefore be possible to use the research findings of [1] as a strong foundation for facilitating collaboration with other companies when selecting a new development tool.

The reasons stated as being important when cooperating over R&D in [1] are based on notion that R&D success can be achieved faster or more cheaply. This can overcome the challenges faced by the company such as insufficient technical equipments and need of expertise to handle problems that rarely arise in the company. These reasons can be correlated with selecting the right development tool. Sharing the burden of reviewing and trying out different tools with many other companies will both speed up and possibly make it cheaper to find which tools are the right ones. In collaborated approach, the possibility of finding right tool by a company which hasn't tried before can rely on choices from other companies who are familiar with field. Finally, executing a long and heavy process of acquiring a tool with limited scope in projects may turn expensive. There are of course barriers to cooperation between companies.

According to [1], collaboration between companies is very vital to have clearly defined goals, results, time frames and cost. This makes sure that all involved counterparts have a common understanding of how the collaboration will proceed and how much is expected to go into it as well as what results can be expected out of it. However, as participating companies or enterprises commit different amounts of energy into such a project may lead to misunderstandings and disagreements. One such factor may be due to lack of transparency in their development tool acquiring process, which is against their policies or claiming that this process is part of what gives them an edge [2]. Companies belonging to this category would probably be less likely to join such groups. The investigation by Kuhlmann [1], demonstrates that companies usually encounter some problems which might hinder cooperation between companies, when procuring new development tools. The risk of losing competitive advantage is regarded as "*prematurely introducing products to the market*" [1], which in terms of development tools can be the release of information about what a company is currently working on. Another problem is that one needs a highly motivated management, which is willing to collaborate with other companies. Getting the management motivated to such a prospect, may pose difficulties in getting absolute consensus over acquiring the desired development tool. Companies are often very keen to communicate with other people why they are using certain development tools to promote themselves towards potential customers and employees. However, they are less frequently interested in talking about tools that they have used/are using which does not work. Collecting the positive information from these companies and thereupon estimating which tools are least used may help to weed out tools that are not so good.

It is possible that some companies will try to sabotage others selection process, trying to keep or gain advantage over the others. However, this might generate a problem as they can no longer rely on the other companies to give them accurate information. Also, the more companies that collaborate, the more the opinions they share and thus such sabotages should become clearly visible. Cooperation with other companies in reviewing and selecting the best development tool is certainly an important notion to take into consideration, especially for smaller companies for which,

heavy, highly formalized methods of procurement can be too costly.

II. SOFTWARE PROCUREMENT PROCESS

Some investigation intended to improve the acquisition of software intensive systems has been conducted by [2], but they focused on large scale governmental procurements. Since the largest number of the procurements is made by small and medium sized organizations, thus additional research is needed. To elicit these needs, this section identifies six steps involved in basic procurement of tool, which addresses problems and challenges experienced by small and medium sized organizations procuring software intensive systems.

A. The Procurement cycle:

The procurement of software can be regarded as a never-ending cyclical process [6]. During the monitoring and evaluation of operational systems, i.e. installed, accepted and running systems, the detection of the need for new software appears. An example of such a procurement cycle is shown in Fig. 1.

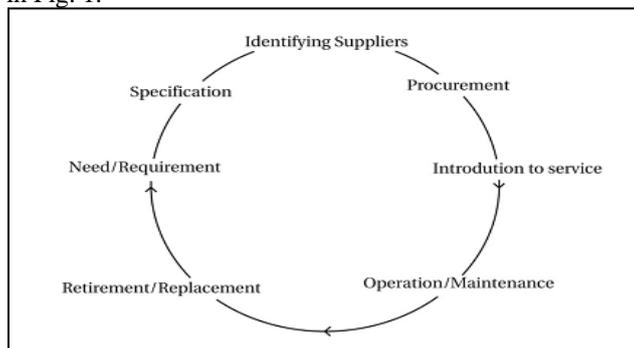


Figure 1: The procurement cycle [6]

This cycle can be segregated into six step procurement process where several approaches can be used to detail the process. These are as listed below;

- a. **Requirement** - Defines a set of requirements for the intended software system. These requirements are meant to ensure that the final system will meet the needs detected in the previous phase by describing the required functionality [6].
- b. **Invitation to Tender** - This involves invitation to suppliers who are requested to compete for the supply of the required software product by satisfying the requirement specifications [6].
- c. **Evaluate responses** - The evaluation is performed after collecting responses from the suppliers, to determine the ones that have met the mandatory requirements. Suppliers' failing to meet these requirements are eliminated [6].
- d. **Vendor / Product selection** - The suppliers listed from the previous stage are investigated in detail to determine the best suitable supplier for the product, it establishes if the supplier can meet the functional and non-functional requirements [6].
- e. **Contract negotiation** - The supplier of the software product negotiates with the management in order to agree upon details of delivery. The contract should be legally enforceable agreement and include guarantees and criteria in accordance with the requirements defined in the initial phase [6].

- f. **Installation/ Testing/ Acceptance** - This phase is to give the procurer the possibility to test the system before final acceptance [6]. Criteria for acceptance should be defined in the requirement phase and agreed upon in the contract. When the procurer is satisfied with the delivered system, the procurement project is signed-off.

III. RISK MANAGEMENT IN SOFTWARE PROCUREMENT

We have seen in [7] that “exposure to the consequences of uncertainty. It includes the possibility of loss or gain, or variation from a desired or planned outcome, as a consequence of the uncertainty associated with following a particular course of action”. To be able to do this, risk management plans and procedures are helpful tools. This is an ongoing task throughout the whole project, and has to be monitored continuously. The following are approaches to project risk management according to [7];

- a. **Establish the risk context** - The purpose of this step is to gather the information needed to establish a structure for the execution of the following steps in the process. The input to this activity is documentation describing the purpose and scope of the project [7]. Identification and analysis of the stakeholders is included in the context establishment. This is done to get an overview of all parties involved in the project, and also to be able to evaluate their needs in relation with the requirements.
- b. **Identify the risks** - This process must be extensive and thorough, so that as many risks as possible are identified. Risks that are not recorded during this phase will not be assessed in the following phase, and they might threaten the success of the project later on. During the risk identification, the key elements defined in the first step of the process ease the systematical examination of the project [7].
- c. **Analyzing the risks** - When all the risks are identified, an assessment of the risks is performed. This assessment can be performed qualitative, semi-quantitative or quantitative [7]. One of the activities that are conducted during the risk analysis phase is the establishment of a priority-setting matrix. This matrix is used in the priority rating of the risks later on. The priority-setting matrix can be of different sizes, depending on the desired scaling.
- d. **Evaluating the risks** - The purpose of the risk evaluation step is to establish a final documentation of the risks, including rating, treatment actions and the name of the responsible person [7]. Some risks may involve inherent risks if they occur. Procurers often face fixed budgets in software procurement projects [7]. With this limitation, the risk prioritizing becomes an important task.
- e. **Treating the Risks** - The final step in the risk management process is to determine, which mitigating actions should be carried out to reduce the risk exposure. The risk management strategies are;
 - i. **Risk Prevention** - This is elimination of the sources to the risk or reducing the likelihood of occurrence of the risk.
 - ii. **Impact mitigation** - Minimizing the consequences of the occurrence.

- iii. **Risk Sharing** - Ensuring that the parties involved takes some of the responsibility, when risks are encountered.
- iv. **Insurance** - Involves the transfer part of the burden of risk to another party. The insurance premium can be regarded as a measure of the cost of sharing the risk.
- v. **Risk Retention** - When the cost of dealing with a risk, one way or another, is higher than the cost of the consequences, the risk is retained but still monitored. It occurs when dealing with risks that are impossible to avoid or transfer.

IV. STEPS FOR SELECTING BEST POSSIBLE SOFTWARE TOOL

Following are some of important steps that are helpful to select the best possible software tool for an organization;

A. Assessing the Needs of the Development Tools:

- a) Educating through the help of experts and consultants.
- b) Study the information sources such as research publications, web articles, journals to get aware on current trends and have better understanding on the core business processes.
- c) Identifying the scope which the development tools can serve.

B. Fact Findings with Team / Committee:

- a) Gathering information from managers affiliated with various departments in the organization and analyzing the knowledge gained through product research.
- b) Involve customers, sales team, marketing team, I.T development team, consultants, accounts and finance departments to gather necessary requirements.

C. Securing management Buy-in:

- a) Determine the immediate economic impact of the tools to the organization
- b) Perform Return on Investment (ROI) for the organization to determine the worthiness of the tools
- c) Analyze the time period for reaching the ROI.

The good development tools should;

- i. Have a low cost of ownership - minimize the cost associated with deploying, maintaining and upgrading their applications.
- ii. Have increased cash flow - Reduce time, expenses of performing tasks.
- iii. Reduced operation costs - this is the main benefit of automating and upgrading the previous system.

D. Development Versus Buying:

- a) The product can have a lower cost than the organization can afford to build it.
- b) Some product vendors have industry experience, which helps in incorporating best practices of I.T in developing their products.
- c) Management support drives the implementation through all stages; management should be involved from the initial stages to the end.

V. DISCUSSION

As elucidated in previous section, there are various steps in choosing appropriate tool for task. However, this kind of process is quite long to develop and takes time for company

to get acquainted with it. It means that, it takes some year to the company to follow each step of this procedure. Moreover, this procedure can be associated with IEEE, which means that the company which uses this procedure should be certified by IEEE standards [3]. A big company will use this procedure whereas a small company, a new born company may prefer the second procedure, as described section 3 on accessing risk in procuring software tools. This one deals with the five factors for a development tool. This procedure is less formal, so easily to use but apparently, have less management and fewer guarantees about the result [4].

Subsequently, each company can also collaborate with other companies. They can or not work on the same market.

If they sell the same product in the market, the concurrency may have a significant impact on the trust of each other. In fact, each company does not want the other company to grow faster than it; it is not its goal to elevate it. Hence, this procedure may work with companies which don't work on the same market but use the same tools [4]. The company can use these procedures separately but they can also combine some of them. For instance, they can select the best processes of each procedure; it is to say the easiest one to "install" into the company. Thus they make their own procedure. Each procedure has its pros and cons. In nutshell, it is the company which will have to choose which the most suitable tool to achieve its goals. .

VI. CONCLUSION

As demonstrated in Fig. 2, we can determine the importance of various criteria in the decision making to choose an appropriate tool. These criteria are more convenient in case of a small company, because it is a non formal way to choose a tool. In contrary, if company is large then it is better to use the four steps as described in previous section for selecting best possible software tool, because is a way more specialized and formal that takes into account the four factors.

Another option is to combine both these processes, and take all the advantage of the criteria's as can be seen in Fig.2 and the four steps for choosing an appropriate tool, in this way we get the facility of the six criteria and the formal way of the four steps. However, collaboration with other companies is another major factor affecting the selection process of tool. This is an immense factor as it brings the experience of other partner company with tool and accountable for providing competitive advantage.

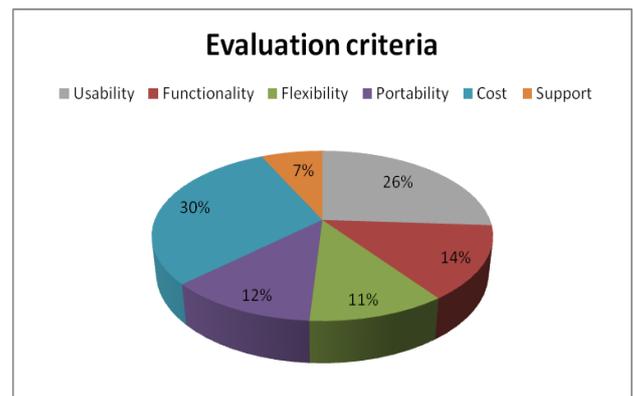


Figure 2: The evaluation criteria of a new tool [2].

There are pros and cons in using different processes for acquiring new software development tools. Using the five factors process is less formal, and should be simpler to determine if tool at least meets some required criteria. On the other hand using the formalized IEEE approach for tool should cover all necessary basis and give a thorough process to follow, even though cumbersome [3]. Collaboration seems to achieve great things between individuals; it might also be useful between companies. Congregating views from more people/ companies facilitates better insight with regards to tool rather than one sided opinion from single person. Collaboration may be used throughout the process, regardless how it is structured or used in steps separately. However troubles of collaborating with organizations and their own agenda or domain may outweigh the benefits of their knowledge [4]. Depending on the needs of the organizations, one can select the process matching the needed profundity or even select the parts from each process that seems most useful. For small companies or less critical tools, a less formalized process may be adopted while following a strict process with critical tools. On the other hand one can argue that following the formalized process will give a better result regardless of the tool. This is supported by [2], which states that companies that have formalized methods for acquiring new tools are more satisfied with the acquirement than companies without formalized methods.

VII. ACKNOWLEDGMENT

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