A SURVEY OF PROJECT MANAGEMENT TOOLS, TECHNIQUES AND METHODOLOGIES USED IN MAURITIUS: THE CURRENT STATUS

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ABSTRACT

Developing countries are very often faced with a shortage of skilled staff, difficult economic and social conditions, weak political institutions, deeply rooted cultural and religious beliefs that all have an impact on development in various disciplines (Nessan, 1993). This paper critically analyses the situation of software project management in Mauritius with a view for further research in the field. Data sets for statistical analysis were collected using two questionnaires, one aimed at gathering information from software development companies and/or staff and another one targeting users of computer software. The use of project management methodologies, tools and techniques, considered as important for assessment by Ralph and Ludin (1996), faced by software developers in Mauritius in particular, were analysed. User satisfaction was one of the criteria analysed by the client questionnaire.

Based on the analysis of the surveys conducted, it was found that there is room for improvement regarding software project management in Mauritius and we speculate that this will also be the case for other regional developing countries. Methodologies developed for use in western countries may not be totally suitable for developing countries. Furthermore, given the assumption of economic rationality and cultural differences and the need to cope with political and community demands on the project's resources, a new project management methodology to be developed to ensure that developing countries, in particular Mauritius, are not left apart, is indicated (Murithi and Crawford, 2003).

Keywords: Software; Project management; Software project management methodologies, tools and techniques; Surveys; Developing countries

INTRODUCTION

Economic rationality is often assumed and cultural differences, political situation and social conditions are usually ignored when dealing with project management. Hofstede (1983) points out that *"project management can be related to differences in national cultures"* and Adler (1983) raises concerns regarding cross-cultural management. Murithi and Crawford (2003) found that *"in Africa, theorists and practitioners in many disciplines are increasingly wary of adopting concepts of (a) western origin"*. Even Turner (1993) as cited by Murithi and Crawford (2003) observed that *"contrary to the common belief that western-oriented techniques of project management are just straight forward procedures that anyone can learn and implement, there are considerable cross-cultural problems in using the approach in non-western countries"*.

The purpose of this survey is to analyse the situation of software project management in developing countries, and Mauritius in particular. A statistical approach is followed regarding data gathered from software development companies and/or staff and users of such software. Mauritius, as is the case in other developing countries are either using methodologies of western origin, or are not using any methodology at all. The information gathered from the questionnaires, after analysis, reveals that project managers in Mauritius are not at present entirely comfortable with the methodologies in use, given that the latter does not appear to yield expected success rates.

To achieve this goal, we briefly consider the research methods adopted in this study in section 2 of this paper while we focus on the analysis of the survey results in section 3. We conclude the paper by observing in section 4 that project management concepts, especially of western origins, may not be universally applicable.

RESEARCH METHODOLOGY

Two questionnaires were designed for the data collection activity. The survey was carried out between July 2003 and November 2003. The target group for one questionnaire focused on software development companies and/or staff. The questionnaire aims at gathering information about the respondents' awareness regarding prevailing project management methodologies in the Information Technology arena. It furthermore surveyed tools and techniques in use as well as the level of success of projects within their organisations with respect to the project parameters such as time, cost and quality. Out of a total of 80 questionnaires sent to software companies in Mauritius and other regional developing countries, 16 completed questionnaires were received. 10 completed survey forms were received from Mauritian companies while 6 forms came from other regional developing countries like South Africa, India, Kenya and Zimbabwe. As the majority of responses were received from Mauritius, we focus in this paper on the status quo of the use of software project management methodologies in Mauritius. It is, therefore, important to note that 10 responses were received from the 21 questionnaires sent to software development companies in Mauritius in particular. Many project managers in Mauritius were contacted by phone to fill in the questionnaires, and it was particularly noteworthy that top managers were reluctant to provide substantial information. Subsequently in section 3 below we present an analysis of the data gathered from this survey with reference to the Mauritian environment. We intend to conduct the survey in the other developing regional countries, with more rigour in the future.

Another questionnaire was dispatched to the users of software that were developed in Mauritius. The objective of this questionnaire was to investigate user satisfaction with respect to software developed and supplied by software companies in Mauritius. A total of 60 users and/or clients were contacted and all of them responded positively to the request for information. Another objective of the questionnaire was to confirm whether or not software companies were making the necessary efforts to ensure user satisfaction with respect to timely delivery, optimum cost and an acceptable quality standard for the product concerned.

ANALYSIS OF SURVEY RESULTS

The data from these questionnaires were used to determine:

- the awareness of existing project management methodologies in use by software developers and/or project managers;
- tasks addressed by the methodologies in use;
- project management tools in use;
- software development approach(es) in use;
- quality management standards in use;
- information reports received from companies regarding projects suffering from failure to meet deadline, budget overrun and user dissatisfaction;
- reasons supplied by the respondents regarding their perception of the deviation in project achievement;
- quality of software from the users' point of view;
- causes of failure of projects to meet expected objectives according to users; and
- factors to improve user satisfaction supplied by the respondents.

ANALYSIS OF SOFTWARE DEVELOPERS AND/OR COMPANIES SURVEY RESULTS

The data collected was analysed and is represented graphically in this paper by considering the percentages as well as mean scores. For some questions, a number from 1 to 5 was requested (1 – strongly agree; 2 – Agree; 3 – Neutral; 4 – Disagree; 5 – Strongly Disagree). The mean score was the average value calculated for a particular question received from all Mauritian respondents. This result shows the tendency of the response for a particular question. In the following subsections we focus only on the data evaluation of the 10 respondents received out of a possible 21 questionnaires distributed in Mauritius in particular.

Awareness of the Existence of Project Management Methodologies

The chart in figure 1 shows that the majority of the methodologies have scored less than 50% regarding their awareness among software developers. This chart indicates that the most popular methodology used in Mauritius is Prince 2 (OGC, 2002; CCTA, 2002), while Euromethod (Helmerich, 2002; Hughes and Cotterrel, 2002) and BS6079 (Hughes and Cotterrel, 2002) are the least known among software development personnel in Mauritius. It is, therefore, reasonable to assume that a significant number of software development personnel in Mauritius are familiar with methodologies such as Euromethod, ISO 12207 (Hughes and Cotterrel, 2001; Moore, 2002), PMBOK (Hughes and Cotterrel, 2001) and BS6079.

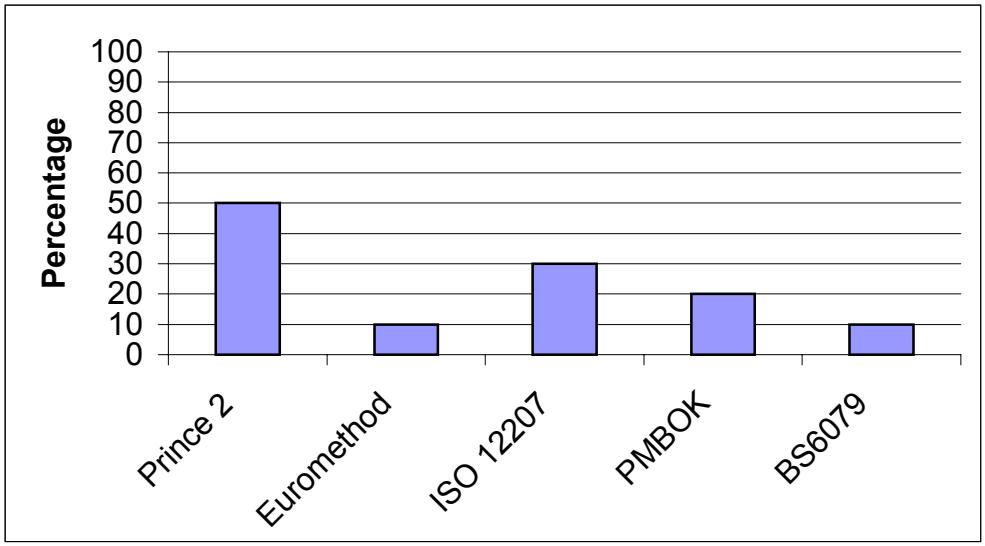


Figure 1. PM Methodologies awareness.

When software developers were polled regarding the methodology they were using, a significant number, 60%, of the respondents mentioned that they were not using any methodology for their software development process. However, it is our perception that some internal guidelines exist so that new entrants to the organisation can at least follow the relevant procedures, note that this perception was not explicitly measured by our survey.

We speculate that some reasons for the absence of a formal methodology include, among others:

- limited time allocated for completion of a project;
- software professionals are not provided with appropriate training regarding software project management;
- scarce staff resources.

All respondents, where a project management methodology is in use, claim to support multi-project management and the average number of projects handled concurrently amounts to 3.6. This appears to be a reasonable average, especially where large projects are concerned.

Tasks Addressed by Methodology in Use in The Organisation

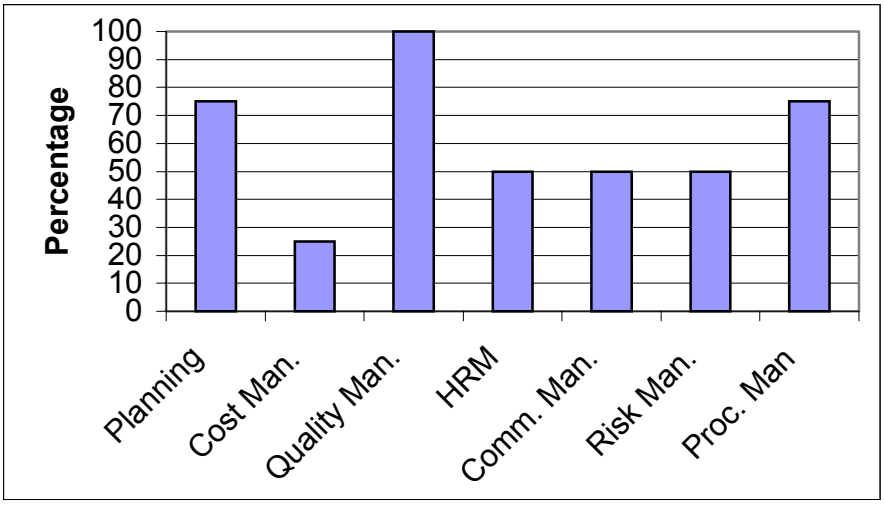
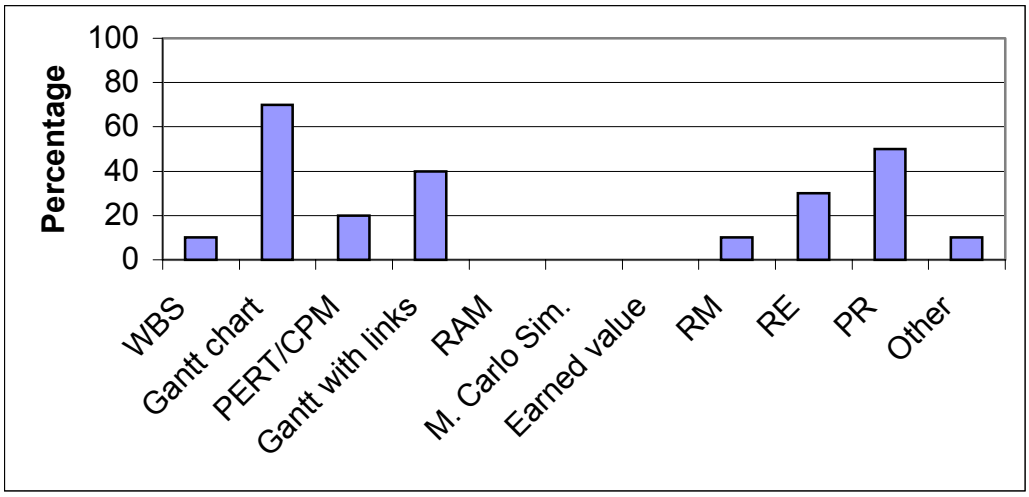


Figure 2. Tasks addressed by Methodology.

From the survey data it seems that the use of a project management methodology emphasises quality management (percentage = 100%), while cost management scores 25%. From the gathered data, planning and procurement management are also well represented at around 75%. Human resource management, communications management and risk management scored 50%. It is, however, possible that human resource management, communications management and risk management are addressed separately

rather than by the methodology employed, although grouping all these tasks under the same umbrella would be helpful.

Project Management Tools Used

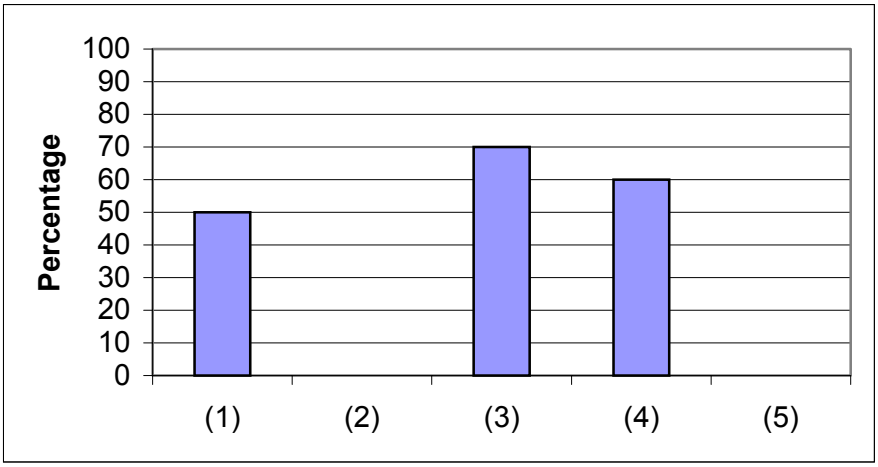


Legend:	WBS - Work Breakdown Structure
PERT/CPM	Project Evaluation and Review Technique/Critical Path Method
RAM	Risk Assessment Matrix
M. Carlo Sim.	Monte Carlo simulation
RM	Responsibility Matrix
RE	Resource Estimate
PR	Progress Report

Figure 3. PM Tools used.

The data gathered indicates that Gantt charts (around 70%), resource estimates (around 60%) and progress reports (around 50%) are popular tools in the management of software development in Mauritius. Monte Carlo simulation seems not to be frequently used by software developers. It appears that in Mauritius, software developers choose Software Project Management tools that do not take much time to implement in practice. This is possibly due to shortages of staff and the difficulty to allocate sufficient time for the use of software project management tools.

Software Development Approach

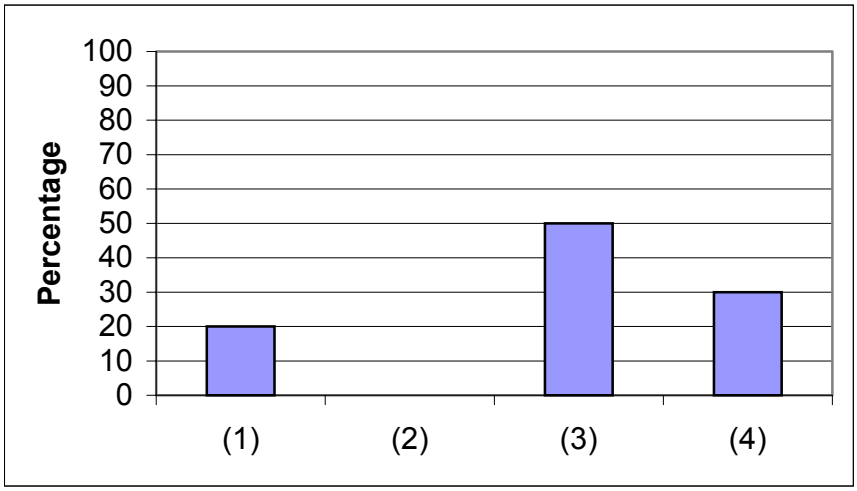


Legend:
(1) - Classical System Development Life Cycle (e.g. based on the Waterfall model)
(2) - System Development Life Cycle (SDLC)
(3) - 4GL (4th Generation Language) techniques
(4) - Prototyping
(5) –Other (e.g. formal methods)

Figure 4. Software development approach in use.

From the data it is found that most software companies prefer relatively short development cycles, where 4GL techniques are best preferred, 70%, followed by prototyping, 60%. The Classical System Development Life Cycle is used less, about 50%. Software with shorter development cycles, such as prototyping, have the added advantage that users can be given a “sense” of the final product. It was noted that companies in Mauritius did reportedly not use SDLC. Software developers and/or companies are generally concerned with the development of software within the minimum period of time.

Quality Management Standards

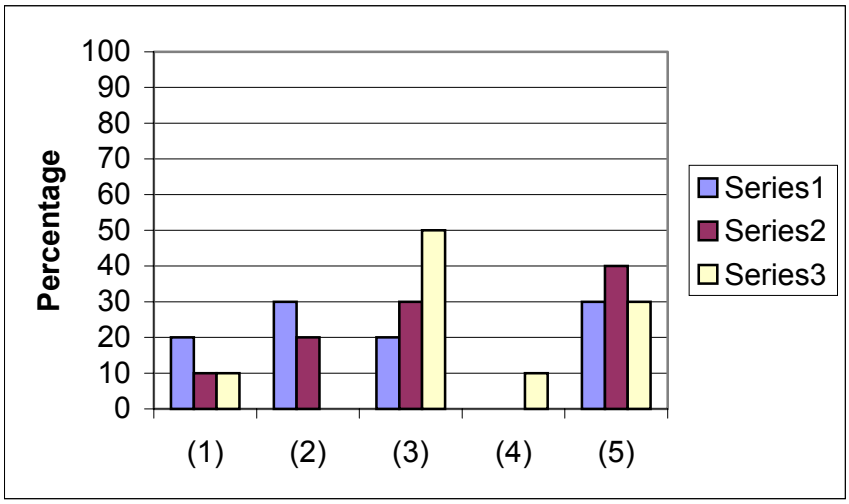


Legend:
(1) - International Standards Organisation (ISO)
(2) - Total Quality Management (TQM)
(3) - A standard developed in-house
(4) - No standard is used

Figure 5. Standards used.

The chart in figure 5, based on respondent information, reveals that 50% of software companies in Mauritius prefer to develop and use their own standards. This is possibly due to a lack of expertise with regards to international standards and difficulty to allocate sufficient time to investigate these standards given the scarcity of qualified staff. However, to extend their trade to other countries, an international standardised approach would certainly present Mauritian companies with a competitive advantage. Software professionals must take note that software project management has also been used for ISO 9000 certification (Ralph, 1999).

Projects Suffering from Failure to Meet Deadlines, Budget Overrun and User Satisfaction



Series 1 represents projects suffering from failure to meet the deadline.
Series 2 represents projects suffering from a budget overrun.
Series 3 represents projects suffering from failure to satisfy user requirements

Figure 6. Projects affected by deadlines, budget and failure to meet user satisfaction.

The approximate annual percentage of projects that fail to meet deadlines, suffer from budget overrun, or fail to satisfy user requirements, were categorised as follows:

- above 75%
- between 50% and 75% (both inclusive)
- above 0% but less that 50%
- 0%
- no response

Figure 6 indicates that:

- 20% of companies sampled claimed that more than 75% of their projects annually failed to meet the set deadlines
- 30% of companies sampled claimed that between 50% and 75% of their projects annually failed to meet the set deadline
- 20% of companies sampled claimed that less than 50% of their projects annually failed to meet the set deadline
- none of the sampled companies claimed that none of their projects annually failed to meet the set deadline
- 30% of companies sampled did not respond to this question.

These figures are quite alarming and we contend that this implies that improvement must be brought about in this area. We, therefore, suggest that better planning needs to be effected and that closer monitoring has to be carried out. It also appears that some companies are reluctant to disseminate the above kind of information.

Regarding budget overrun:

- 10% of companies sampled claimed that more than 75% of their projects annually suffered from budget overrun
- 20% of companies sampled claimed that between 50% and 75% of their projects annually suffered from budget overrun
- 30% of companies sampled claimed that less than 50% of their projects annually suffered from budget overrun
- none of the sampled companies claimed that none of their projects annually suffered from budget overrun
- 40% of companies sampled did not respond to the question.

Again, we deduce that much improvement is required in this area.

Regarding projects suffering from failure to satisfy user requirements, we note the following:

- 10% of companies sampled claimed that more than 75% of their projects failed to satisfy user expectations
- none of the sampled companies claimed that between 50% and 75% of their projects failed to satisfy user expectations
- 50% of companies sampled claimed that less than 50% of their projects failed to satisfy user expectations
- 10% of companies sampled claimed that none of their projects failed to satisfy user expectations
- 30% of companies sampled did not respond to this question.

These figures are equally alarming and we speculate that this area particular to software project management methodologies currently in use in Mauritius requires further research.

Factors for Deviation in Project Achievement

Responses for the factors for deviation in project achievement as supplied by the respondents, were assigned values on a scale from 1 to 5 as shown below:

Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
1	2	3	4	5

The mean score was the average value calculated for a particular question. This result then depicts a tendency of the response for a particular question. In figure 7 below, the mean score varied between approximately 2 and 2.5 for all the factors under study, which implies that respondents are of the perceived opinion that all of these factors have to be overcome for software projects to be successful in Mauritius.

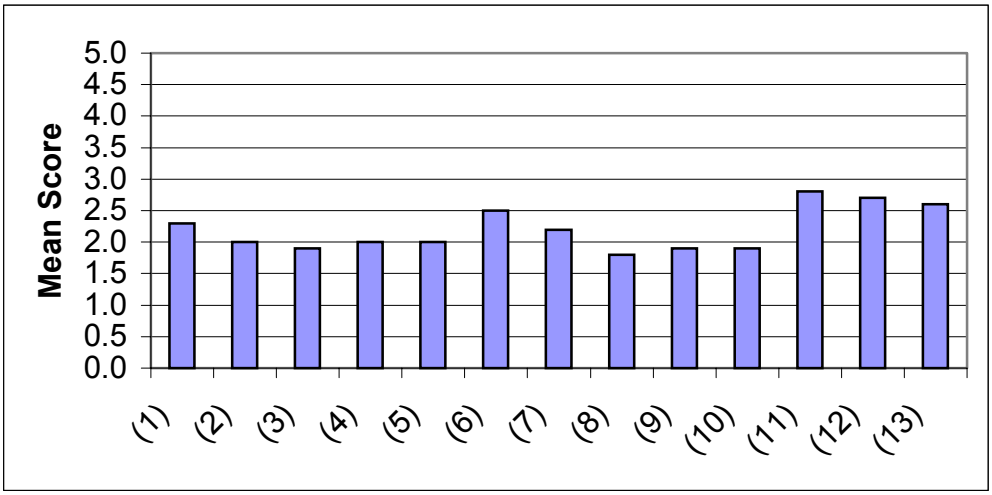


Figure 7. Reasons for deviation.

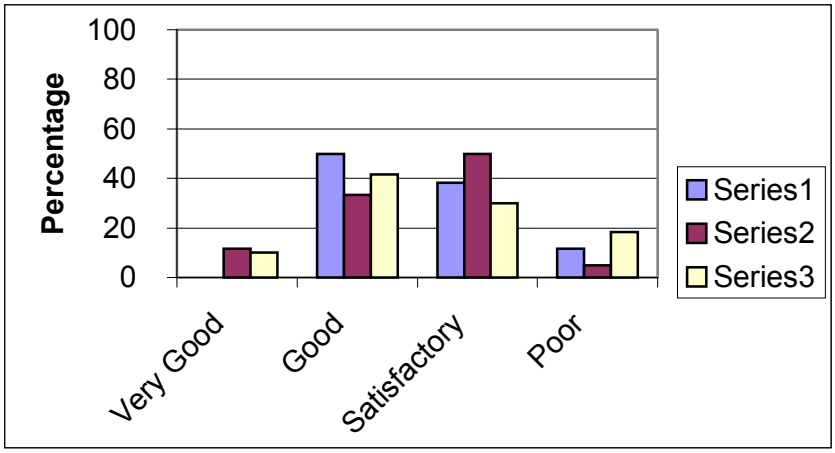
The legends used in figure 7 above is as follows:

- No formal methodology is used
- Poor planning
- User resistance
- Inadequate or improper communication infrastructure (between project team and customer)
- Inappropriate project team
- No executive support
- Failure of project team to understand user needs
- Inadequate or absence of user involvement
- Risk Management
- Difficulty to cope with concurrent projects
- Lack of expertise in innovative/new technology
- Lack of skilled professionals
- Mobility of labour

ANALYSIS OF CLIENT SURVEY RESULTS

The data collected was analysed and represented graphically by considering the percentages as well as mean scores. In the following subsections we will focus only on the data evaluation of the 60 respondents who provided feedback regarding the use of software developed in Mauritius. Note that a 100% response rate was achieved in this part of the survey.

Quality of Software: A User Perspective



Series 1 represents user friendliness of software.
Series 2 represents performance of software.
Series 3 represents security features of software.

Figure 8. Rating of quality.

The majority of users of software are satisfied with the user friendliness features of such software (50% of respondents view this feature as “Good” and 40% as “Satisfactory”). This is probably attributed to the generally short development cycles used in Mauritius, whereby users are exposed early on in the development phase to a prototype version of the software under development.

50% of the respondents are satisfied with the performance of the said software. Respectively 35% and 10% of users view software as “good” and “very good”. Again, this may be attributed to short development cycles, whereby users are exposed early to the software under development.

40% of users rate security features as “Good”, 30% as “Satisfactory” and 10% as “Very Good”. Around 20% of users are of the opinion that security features are poorly addressed. The high degree of user satisfaction in this respect may also be attributed to short development cycles, whereby users are exposed early to the software under development.

Causes of Project Failure to Meet Expected Objectives: A User Perspective

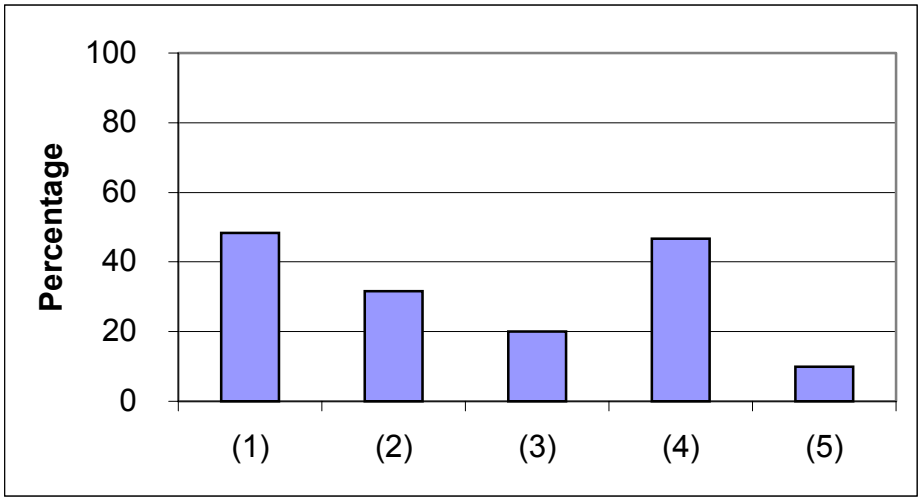


Figure 9. Causes of failure.

The following legend is used in figure 9 above to indicate the causes of project failure to meet expected user objectives:

- lack of communication between supplier and customer
- lack of experience on the part of software developer
- unprofessional mind-set of supplier
- possible lack of best practices for software development and IT management
- none of the above reasons are applicable (i.e. other reasons exist).

Most users are of the opinion that the causes of failure to meet expected user objectives can be attributed to (1) - “lack of communication between supplier and customer” and (4) - “possible lack of best practices for software development and IT management”. One can thus summarise their perception to include improvement of communication, the need to review software development practices by the developers and better IT management is called for.

Factors to Improve User Satisfaction: A User Perspective

The following factors are considered to evaluate customer satisfaction in figure 10:

- improving communication between suppliers and users through regular meetings or informal discussions
- frequent participation of users in the software development process by providing regular feedback
- suppliers should consider user satisfaction seriously rather than just abiding strictly by the specifications agreed upon initially on award of a contract
- a chief information officer (CIO) in charge of issues pertaining to IT should be appointed on the user side
- each user department must recruit its own software developers, IT manager, System Analysts, Database Administrators, etc.
- more effort should be devoted to the elimination of errors in software.

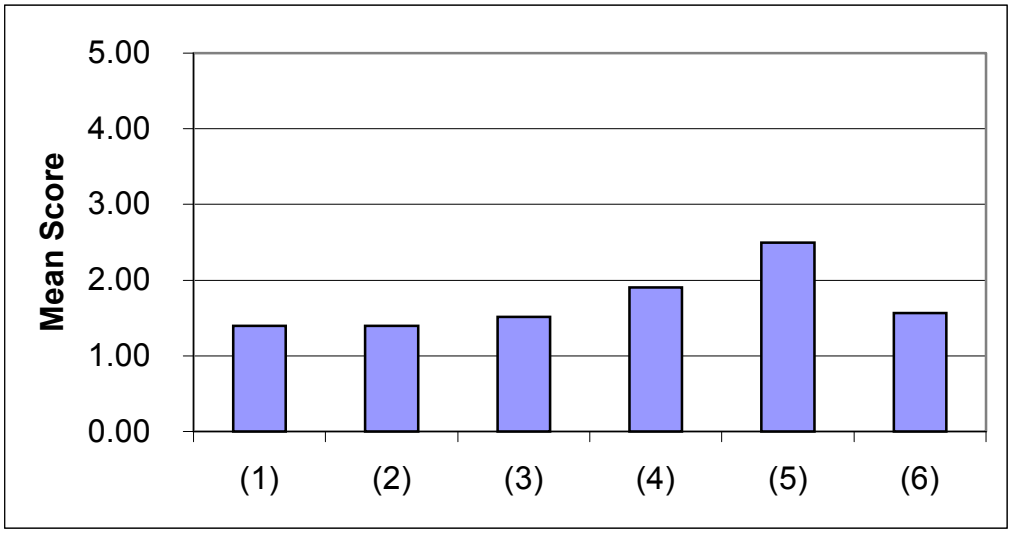


Figure 10. Factors to improve user satisfaction.

The responses for factors that may enhance customer satisfaction with respect to software were assigned values on a scale from 1 to 5 as shown below:

Strongly Agree (SA)	Agree (A)	Neutral (N)	Disagree (D)	Strongly Disagree (SD)
1	2	3	4	5

The mean score of the responses lies mostly in the "Agree" to "strongly Agree" category (mean score of between 1.5 and 2) for most of the factors, except for the factor (5). Therefore, from a user's point of view, most of the factors considered have to be addressed during project management.

CONCLUSION AND FUTURE WORK

Based on the survey that we conducted in Mauritius and reported on in this paper, we conclude that a large number of companies are either not comfortable with existing methodologies, which have western origins, or are not using any methodology at all. Naturally, it is important to use some or other methodology rather than not use any methodology at all. The absence of a methodology advances chaos in a software development process and may contribute to the failure of a project. In such situations software development as well as project management tend to be performed on an ad hoc basis, thereby leading to inefficient management of time, budget and quality.

From the results of our survey, we observe that project management concepts, especially those of western origins, may not be universally applicable, as is demonstrated in the Mauritius case. Developing countries have to constantly face a shortage of skilled staff, difficult economic and social conditions, weak political institutions, as well as deeply rooted cultural and religious beliefs. Therefore, there is a need to encourage the emergence of project management methodologies of a certain indigenous nature, which can cope with the actual status of such countries and stand a better chance of survival (Strucenbruck and Zomorrodian, 1987).

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