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The Impact of Maintenance Planning on Large Project Management Performance

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Abstract— Structured methodologies and tools for the tailored design of factories are adopted by suppliers of manufacturing systems but usually discontinued after the design phase. The use of an ontology-based virtual factory, continuously synchronised with the real plant, is proposed to guarantee digital continuity and enable in-situ simulation during the operating phase. This digital counterpart of the system can be used for integrated shop-floor simulations to assess production and maintenance planning decisions' future impact. An industrial application is provided in the context of roll shops, i.e., systems devoted to the grinding of cylinders for rolling mills.

Keywords: *Communication planning, tools, Factors affecting the quality, method*

1. INTRODUCTION

A project is defined as a set of interrelated tasks to be executed over a fixed period and within certain cost and other limitations. Therefore, a project consists of a set of activities to be done until the project is achieved. Nevertheless, the project needs planning, organising, leading, and controlling to make the process flow smoothly and ensure no delay in achieving the aim within the predefined period. This will be more significant when it comes to megaprojects, consisting of countless activities and tasks in parallel or sequentially. Large projects involved with huge number of activities. Those activities are planned in a specified period. The activities of the project have to be planned carefully and effectively. The project usually involved with machines, equipment, labor, processes and not all these elements may be available all the time. In reality so many obstacles associated with the execution of the project activities, such as vacations of staff, resources availability and planned maintenance [1]. Machines are subject to deterioration due to their use and exposure to the process and environmental conditions. This deterioration requires to be duly taken care of by various maintenance skills and techniques at minimum cost so that the required use of facilities can be continued and service life extended to the point where maintenance costs become more than the replacement cost [2]. There are two types of maintenance planning which are (i) planned and (ii) unplanned maintenance. The planned maintenance can have less effect on the project management performance because the maintenance is already scheduled within the project activities. Fig.1 depicts the different types of maintenance available in managing the machines and equipment [3].

Large projects consist of numerous activities and involve high investment in the equipment, processes, and operations. For successful management of the project, planning is a very important step to be taken because it will decide what activities to be executed first and how the flow of activities will be executed. Nevertheless, the maintenance planning for machines and equipment involved in the project will have an impact on project management performance.

The effect of maintenance planning will be critical when some of the equipment suddenly failed. It will affect the execution of the current project activity and preceding one and the overall project completion time will be longer. Therefore, higher investment cost will be borne by the project holders, which is undesirable. This also will have an impact on the project management team [4]. There are many causes for planned activities interruptions.

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An activity may be interrupted because some renewable resource becomes unavailable during a rest time or a planned maintenance operation, which will create a scheduling problem [5].

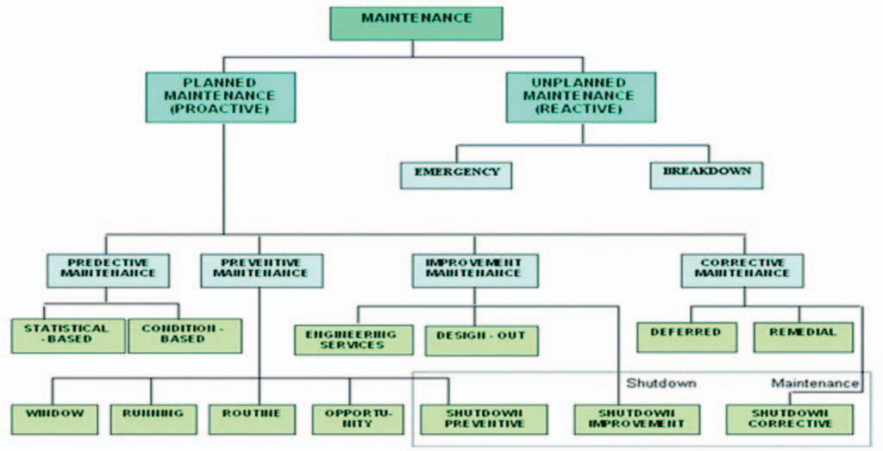

Fig.1.Different types of maintenance planned and unplanned [3]

2. COMMUNICATION PLANNING FOR PROJECTS

Project-communication management is recognised as a key project-management knowledge area by the Project Management Institute (PMI, 2008: 43). Part of the communication management process is communication planning, which can be defined as the process of "determining the project-stakeholder information needs and defining a communication approach" (PMI, 2008: 243)[6]. This section considers the various strategies, mechanisms and tools for communication planning in the project environment.

According to Yates (2006: 77), communication planning tends to occur reactively to communication needs, as opposed to occurring proactively – even though it was found that formal communication plans do facilitate the communication process (Carvalho, 2008: 1282)[7]. Project communication planning starts with identifying various parties' needs and then focusing on the sharing of information, providing feedback and managing the stakeholders (Carvalho, 2008: 1281).

Communication planning is closely linked to stakeholder management. According to the PMI (2008: 261), stakeholder management is a process of communicating and working with the stakeholders to meet their needs and resolving issues as they occur; and it includes:

- Managing stakeholder expectations and keeping them engaged.
- Anticipating and addressing concerns that might later become problematic.
- Resolving knowledge issues.

2.1 Communication tools

The quality of team communication is highly dependent on the communication acts of the individual team members, the use of their preferred communication media, and the access to easy-to-use tools (Otter and Emmitt, 2007: 409)[8]. There are many tools available to project teams, and, in general, the more tools used by the group, the more successful a team is likely to be (Ziek and Anderson, 2015: 791). This section considers the various tools available to project teams, taking into account their potential benefits and shortcomings. In the project environment, project team members may find themselves working in separate locations (remotely located) or together (collocated) with other team members (Lockwood, 2015: 126, Daim et al., 2012: 200). Choosing appropriate communication tools is thus a significant consideration for project managers; as effective communication tools must cover both synchronous (real-time) and asynchronous (delayed) communication, where team members may be either remotely or collocated (Gorse and Emmitt, 2007: 1197).

Nicholas and Steyn (2012: 443) propose that project-management information systems (PMIS) be used as tools to enable both synchronous and asynchronous communication, defining them as "systems for collecting, organising, sorting, processing, and disseminating information". Practical examples of PMIS for project teams

would include online or network[9].

2.2 Factors affecting the quality of communication

According to Stempfle and Badke-Schaub (2002: 493), even when communication tools are successfully implemented, the nature of the communication may still be inadequate. This section identifies those factors that have an impact on communication in project teams, and it considers strategies for how to manage them. Communication is described as the effective transmission of information (Barker, 2010: 1) or, as the process by which information is exchanged and understood by two or more people, usually with the intent to motivate or influence behaviour (Cunningham, 2014a: 188). The ability to communicate efficiently and effectively is one of the most important skills required by a project manager (Ziek and Anderson, 2015: 789)[10]. The communication process involves the following basic elements: a sender, a receiver; the message; a channel; coding/decoding and feedback (Carvalho, 2008: 1280).

The transmission model of communication, favoured by project managers (Ziek and Anderson, 2015: 788), starts with the information transmitted by the sender; and it then is received by the recipient (Barker, 2010: 2). This is, however, an over-simplified view; as before the message can be transmitted, the sender must first perceive a need to communicate, resulting in the sender having to encode a thought. In other words, the sender has to pay attention, understand and implement what is understood in context (Barker, 2010: 4). This encoding process requires a great deal of skill, which includes writing, speaking, reading, listening and reasoning skills (Cunningham, 2014a: 191)[11].

3. RESEARCH DESIGN AND METHOD

3.1 Method

The research project attempted to understand the way that high-performance team members perceive project-communication planning; how they feel about communication methods; and how they would prefer to communicate. The focus of the study was thus to explore personal experience and feelings by communicating face-to-face with the team members. The themes explored and the use of interviews to collect the data aligned with a qualitative approach to the research study. This approach is supported by Leedy and Ormrod (2005: 95), who explained that qualitative methods are appropriate, where the purpose of the research is to explore and interpret, and where the researcher will be searching for themes and categories, based on the words of the people involved.

The research sought to develop a deep understanding of the research questions; as they pertain to Aurecon. Considering the setting of the research study, a case-study framework was adopted to guide the research process. This type of research design is useful for "generating an understanding of and insight into a particular instance, by providing a thick, rich description of the case, and illuminating its relations to a broader context" (Rule and Vaughn, 2011: 7)[12].

This research project made use of a semi-structured interview process in order to collect the data. The semi-structured interview type was selected to ensure that the sub-questions were addressed – without making the interviews too rigid. This method also allows researchers flexibility in how the interviews are conducted, as opposed to structured approaches [13].

3.1.1 Orientation sessions, communication and planning

For purposes of orienting both the employees of the company and the facilitators of change, i.e. the Change Management consultants, the following activities took place:- change management detailed planning sessions were organised change management consultant's induction (1,5 days) into the region took place change management consultants (CMC) facilitated orientation sessions with the management team and end-user groups further, the company developed means of communicating implementation activities (regular briefs, meetings, posters, etc.) organised visits to/from implementing other companies for learnings conducted role clarification sessions with the company's enterprise resource planning system trainers, super-users and champions

3.1.1 Analysis of data collected

The results of the survey were analysed by summing responses (strongly agree, agree, neutral, disagree and strongly disagree) by groups, that is, management, super users and the shop floor. Thereafter, the percentages of responses within that group were calculated. Thus, the percentage of results quoted relate to each group individually. Where comparison is drawn, it is done purely on how each group responded, not as a sum of all responses by all groups in a specified category of questions. Percentage figures of the results were rounded off to the nearest whole for uniformity.

4. RESULTS AND DISCUSSION

There is a contradiction with regards to the training and development of career paths for maintenance personnel. On the one hand all seem to think that maintenance personnel are well trained, yet there are no clearly defined career paths being implemented. The general perception that is painted is that of management, who seem to believe that maintenance practices are not that good, table 1. The super users, on the other hand, are more optimistic about maintenance practices. More often, the shop floor agreed with the view of management. The responses (in rounded percentages) given about perceptions on maintenance practices are shown in table 1.

Table 1. Perceptions of maintenance practices

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Management	0	21	33	33	13
Super users	0	3.7	23.8	55	17.5
Shopfloor	3	11	42	39	5

A concern may also be raised on the high number of neutral responses from the shop floor, see fig. 2, compiled from the data obtained from the research survey, appendix 2. The Enterprise Resource Planning system was analysed in terms of its capability, effectiveness, its use as a management tool, and its handling of errors from the data collected and computed. The system's capability addresses what the system is able to do as perceived by management, super users and the shop floor.

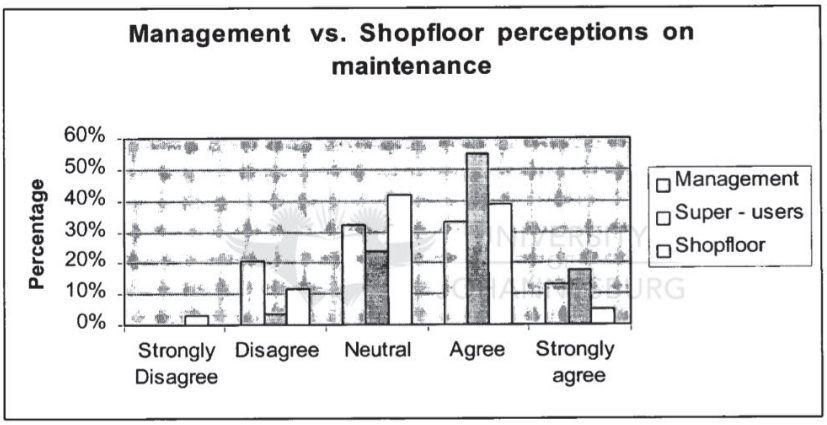

Fig. 2. Perceptions of Management, Superusers and Shop floor on maintenance Practices

From the survey, the following results were obtained; 40 % of management, 40 % of super users and 50 % of shop floor agree that the system is capable, fig. 3. This result is confirmed by the study conducted by Forrester, who asserts that today's Enterprise Resources Planning systems, due to some extent, meet current requirements of process environment.

The fact that 20 % of each category of people surveyed disagrees with the statements in general confirms that the system still requires improvement. The system effectiveness section of the survey addresses an Enterprise Resource Planning system's ability to carry out maintenance activities. In this section 60 % of management respondents, 10 % of super users and 50 % of shop-floor agree with the statements, fig 4. It is notable that 40 %

of the super users strongly agree with the statements. One may conclude from this that the system is effective in supporting maintenance activities.

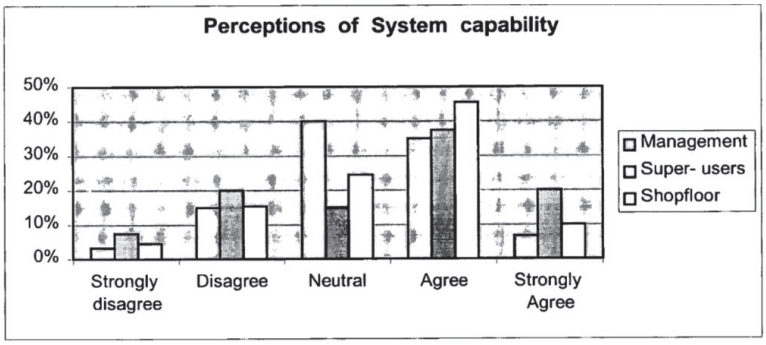

Fig.3. Enterprise Resource Planning System capability

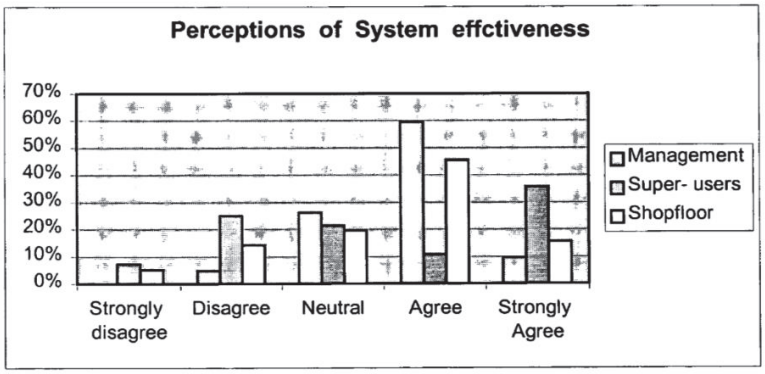

Fig. 4. Enterprise Resource Planning System effectiveness

The results of whether those who use the system view the system as a management tool are interesting in that only the shop floor agree with the statement with 50 % and a further 30 % of them strongly agreeing with the same statements, fig. 5. Only 30 % of super users and 40 % of management agree with the statements. On the other hand, 30 % of management and 30 % of super users were neutral on these statements. This is a worrying factor since both management and super users are at the management level and it seems the system does not meet their requirements.

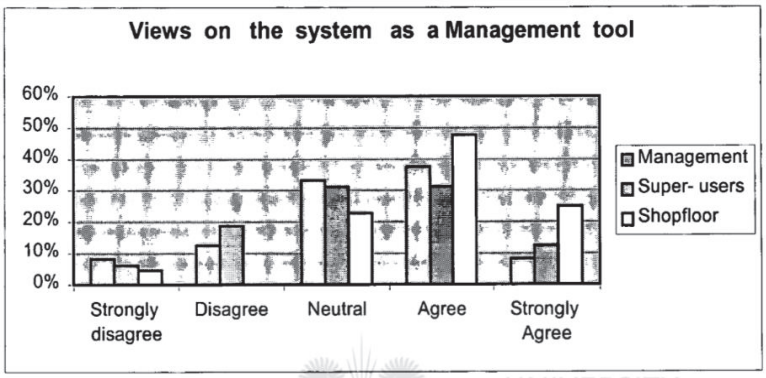

Fig. 5.Enterprise Resource Planning system a management tool

In as far as the system's capability to handle errors is a concern, there seem to be mixed feelings across the board. 40 %, 30 % and 48 % of management, super users and shop floor, respectively, agree that the system can handle the errors as shown in Fig. 6.

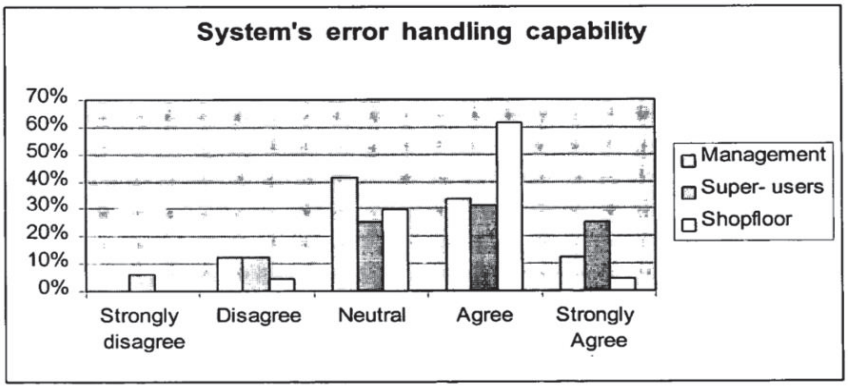

Fig. 6. System's capability to handle errors

5. CONCLUSION

Form the research survey it has crystallised that the integrity and effectiveness of the maintenance management software system require further improvement, which should be done by developers of Enterprise Resource Planning systems. The current Enterprise Resource Planning systems can not meet a fundamental requirement of a process environment which is that of being proactive in order to be competitive - the Enterprise Resource Planning systems are reactive and are not intelligent.

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