THE EFFECTIVENESS OF USING PROJECT MANAGEMENT TOOLS AND TECHNIQUES FOR DELIVERING PROJECTS

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ABSTRACT

In today's dynamic commercial environments, project management is becoming more and more crucial in supporting organizations to achieve their enterprise goals. However, increasing task complexity in projects, finishing projects on time within budget, and achieving the scope of the project becomes ever difficult. The purpose of this research as arisen from one of the most important areas in project management, both from a research and a practitioner perspective; 'How to avoid project failure and achieve higher rates of project success?'. The outcome of this work is to demonstrate how the adoption of project management tools and specific risk management software, if successfully implemented, can be important tools in enabling project managers to achieve higher levels of success.

Keywords Project Management, Project Management Tools and Techniques, Risk Management

1 INTRODUCTION

There is no doubt that any project manager has to make difficult decisions that could ultimately affect the stability and security of his or her organization. The most difficult decision that a project manager can face is to determine which project can be accepted and consequently secure investment of the enterprise's recourses. However, deciding to invest in a particular project requires making great efforts to make sure that the project would increase the company value otherwise the company may experience lost time, money, and valuable resources which could be used in other investment opportunities. Nowadays, project management has been developed and supported by various tools and techniques. Patanakul et al (2010) propose that by using appropriate tools and techniques in the right way will have direct impact on the delivery of a successful project. Despite the fact that with all the support and help which can be provided by using some well known project management software and structured approaches, projects may still fail to meet their target deadlines and remain within their budget. Leach (2004) indicates that many things can go wrong during the course of any project and these may lead the project to not satisfy its objectives. Additionally, it is argued (Potts, 2002) that there is no doubt that any estimation for the project's costs is likely to have a margin. Generally, it is accepted that a good process of project evaluation and control, supported by appropriate project management tools and techniques, can reduce the incident of projects being over time and over budget. In a useful survey (Ali, 2008), findings indicate that all project managers should be trained in the use of project software in order to deliver effective management for their projects.

2 DEFINITION OF THE PROBLEM

The purpose of this research as arisen from one of the most important areas in project management, both from a research and a practitioner perspective; 'How to avoid project failure and achieve higher rates of project success?'. In reality there are many cases in which enterprises experience project failure. Typical examples of failure are often reported in both Information Technology (IT) and engineering environments. For instance, Schmidt (2005) reported that: 'only around 20 per cent of all IT projects are completed on time and within budget; an average project take twice as long as estimated and is approximately 200 percent over budget; and projects, regularly only deliver 2/3 of their planned scope. A similar report released by Panorama Consulting Group, indicates that 93 percent of all Enterprise Resource Planning (ERP) project implementations exceed their deadlines, 65 percent of ERP projects are completed over budget, and only 39 percent of the organizations in the survey agreed that they recognize the expected benefits from their project implementations (Panorama Consulting Group, 2008). The problem of projects being late and over budget has received a considerable amount of interest from both the academics and software developers. Despite the fact that many of software vendors claim that their services or software packages provide optimal solutions for managing a project successfully, many organizations still experience project failure even by using

well known contemporary IT solutions such as ERP systems. Lindley et al (2006) stated that not identifying the hidden costs in ERP projects is one of the major reasons that enterprises experience overspending and overtime in such projects. However, Shenhar (2008) argues that the highest degree of project failure is related to management problems in the first place. It is also widely believed that project failure could be regarded as a result of system incompatibility or that the software package used by the enterprise did not fit its requirements. In further research, Lawrence (2007) states that insufficient risk management is one of the main factors, which is likely to cause project failure. However, good project managers can determine the largest amount of risks and its impact on their project in order to reduce the incident of projects being late and over budget.

3 PROJECT MANAGEMENT TOOLS AND TECHNIQUES

There exists a wide range of different project management tools and techniques which can be used to support project managers in making effective decisions during the lifecycle of long term projects, typically comprising numerous dynamic tasks. However, in the world of business it is typically considered that everything is required to be undertaken in a very short timeframe and to produce outstanding results of exceptional quality. As such, dealing with hundreds or potentially thousands of project tasks has become almost impossible using ordinary manual calculations. Moreover, because of the tremendous improvement in the computer technology, some software packages and programs also have become favorable and widespread in field of the engineering project management. For instance, using spreadsheet functionally in Microsoft Excel (MSE) is one of the most popular tools used to build project management models and to undertake risk analysis for many projects. As Day (2003) states, 'MSE's scenario manager is one of the powerful functions that can be used to analyze the affect of different scenarios on the best estimation of the project'.

Therefore, it can be considered that MSE is now a traditional tool with which to undertake project evaluation. However, within contemporary IT markets there exist different tools which can be used for analyzing project risk by implementing more sophisticated statistical techniques, such as Monte Carlo simulations. One of the widely known tools is called Palisade Software which can fully integrate and operate within MSE. Palisade is one of the worldwide known corporations which specialize in producing data analysis software including risk analysis software. Palisade Corporation was founded in 1984 and its first product, PRISM existed as a solution in which risk could be quantified for the first time on desktop computer by using Monte Carlo Simulation. The company became one of the world's leading risk analysis software providers when it presented the @Risk package with the new feature of implemented Monte Carlo simulation within the Excel spreadsheets (Palisade, 2010). Presenting the results in a graphical manner is one of the primary benefits of using @Risk, as these graphs provide the decision makers with useful results in a way that help them in taking their decisions more confidently. For instance Rudd (cited in Palisade, 2010) pointed out that by using @Risk, their chief executives can take a decision in minutes with 80% confidence.

Palisade software also can integrate with Microsoft Project (MSP) and be used to undertake risk analysis on estimated or ongoing plans in the way that help project managers to make improved estimations and more effective control of the project costs. According to Ron (2000), 'MSP is one of the most powerful tools which have been designed to help the users in managing projects effectively. MSP contains various sets of valuable functions that can provide project managers with almost everything they need for planning, monitoring, and controlling their projects'.

In terms of planning MSP is used effectively to generate the cash flows of a project especially in a capital project where it contains numerous of tasks. MSP can deal with thousands of tasks and resources in one plan at the same time, so in the planning stage it allow to save a lot of time as it generate numerous calculations that can be considered difficult or time consuming to perform manually (Lisa, 2002). Nevertheless, it is widely recognized that calculating Earned Value (EV) is considered as one of the powerful tools which can be used for the purpose of project control. Lock (2003) believes that EV analysis can be considered as the missing link between cost reporting and cost control. However, MSP can be used effectively for controlling a project during its implementation stage, as EV can be calculated automatically by MSP when the original plan within MSP is updated.

4 METHODOLOGY

The overall methodology employed within this research was to undertake an industrial case study in which a typical risk management software package (Palisade Corporation @Risk) could be examined for the purpose of identifying and evaluating the effectiveness of implementing such tools for helping managers in taking their decisions. The high level methodology that was implemented by the author comprised two simple steps: 1) To study and analyze the current practice for an industrial case study enterprise, and 2) To examine and evaluate if appropriate project management software could be implemented to improve real life project delivery performance. In this paper, a representative sales order quotation process was analyzed within a third party enterprise, to examine the effectiveness of using @Risk in risk analysis calculations and to compare the result with the existing business processes internal to the operation of the partner enterprise, Figure 1.

5 THE CASE STUDY

This case study represents a practical application to enable the author to experience the benefit of using project management software in order to improve the enterprise's productivity. The case study organization is a customer-focused Group consisting of three individual, but collaborative enterprises. Together, the Group provides the engineering and manufacturing sector with machine maintenance and repair services. In the event of relocated machines or equipment breakdown, the Group's commitment to its customers is to provide a quick response to return their machines into service. The Group enterprises share their resources between each other and hold a total resource of 16 engineers. In terms of planning aspects, the Group depends mainly on a manual technique, using whiteboards for carrying out their planning activities. The Group relies on the experience of their engineers for the production of quotations and paper systems are used mostly for handling orders. More recently, the Group has started to computerise some of their activities mainly relating to financial aspects, but all of the enterprises are now using MSE spreadsheets for the production of quotations and cost estimation for forthcoming projects. The board management of the Group aim to identify suitable project management tools and techniques in order to improve the efficiency of their resources.

The Group offers clients a broad range of bespoke commercial arrangements; comprising service agreements, maintenance and breakdowns offerings, together equipment sales and refurbishment. The Group has signed many service agreements that include undertaking full maintenance and service schedules, which could be delivered once or several times in the year. Also in case of breakdowns events these agreements cover a rapid respond from the Group, which must be completed within 24 hours from the time the order is placed. In relation to this commitment to their customers, the Group has faced many challenges with respect to the re-planning of schedules due to potential resources shortages and time pressures.

When maintenance or refurbishment orders are requested by client email or fax, a quotation is issued for that request depending on the tasks that are contained within the customer enquiry, which sometimes is clarified and confirmed by a further telephone call, and potential site visit. However, because of the high risk and uncertainty of some tasks in this kind of work, the Group regularly has to add a risk factor to the total amount of its quotations in order to cover any increase in the project's costs which could happen during the implementation stage. The risk ratio, which applied to only maintenance and refurbishment contracts, is depending on how risky is that project, in some cases could rise up to 40% which is counted from the total amount of the quotation. However, this safety factor is assigned according to the experience of the Group's engineers and similar previous projects undertaken. The main risk here comes from increasing tasks durations which are counted in hours and leads to higher project cost which, may subsequently affect other projects in the main plan of the Group.

By analyzing the current practice of the Group, initial findings indicate that because of not using any kind of formal project management tools and techniques, the Group may be missing out on valuable opportunities for improving its productivity and quotation conversion. However, in order to remain competitive in the market there are two main issues that raised from this case study and have already been addressed: First improving the estimations on quotations; and Secondly, to help Group quotation engineers in the formal planning process.

6 THE RESULT

The main issue here relating to the generation of a quotation was regarded as the application of a safety factor, which was known internally as 'Murphy's Law', on the total amount of the quotation. This meant that Group in fact is assigning a safety factor for the duration of some tasks that are not required to have any margin of risk. On the other hand some tasks' duration were uncertain and may require a high risk factor. This problem may be solved by using @Risk Software as it contains functions such probability distribution which allow the user to apply different risk factors on each single task. In a real quotation for refurbishment of 1000 Ton Forging Press this implementation was considered. Within this quotation a 'Murphy's Law' risk factor of 20 percent was applied for the whole project, resulting in raising the total cost amount from £20,958 up to £25,149. Figure 1 illustrates the quotation generated by using the old criteria in Excel spreadsheet.

In the simulation, the function of probability distribution was used is the 'Triang' as it allows to have three values: minimum; most likely; and maximum; which are required for the purpose of this research examination. However, the same percentage of risk factor 20 percent is applied for all the tasks in the quotation by using @Risk in order to compare the results obtained for the same assumption with the old system. Figure 2, illustrates the process of assigning inputs in the simulation. After assigning the inputs, outputs and running the simulation, the results were presented automatically, as shown in Figure 3. This indicates that there is 90 percent chance that the total amount of the quotation cost could raise up to £22,799. Also, the results from the simulation, as shown in Figure 4, indicate that there is 90 percent chance of increasing the total hours required to finish the work, rising from 2106 to 2473 hours. According to this result, the project would be expected to run 367 hours over the original estimated time, which is increased by further increased by about 15 days. In contrast, if 20 percent increase was applied to the total period of the project according to Group's quotation engineer expectations, the working hours will be expected to rise from 2106 up to 2527.2 hours, which is evaluated at around 17.5 days overtime.

In order to have better estimation for project cost and durations, it is possible to check from the simulations, which are the most important tasks in terms of costs that have significant impact on the total cost of the project then recalculate the risk factors for each of these tasks in the software and re-run the simulation. This can provide the Group's managers the opportunity of making more effort to control these tasks in order to reduce the incidences of being late and over budget in their projects. Figure 6, illustrates the impact of tasks on the budget refurbishment project.

After modifying the simulation, the results in Figure 5 shows that the hotel accommodation and the mileage were the most significant regressions in the projects. For the purpose of the software evaluation it was assumed that the management would take of effective control of these costs and if there existed an increase, it would not exceed 5 percent and this would be applied with a further, new simulation. However, the results obtained from the simulation in Figure 6, indicates that there could be a slight decrease in the estimated total cost of the projects; from £22,799 down to £22,404. Also, the project working hours were decreased from 2473 down to 2190 hours, through which it could potentially save 283 working hours.

By analyzing the results, it is indicated that the simulation gives a much better cost estimation, since the foundation cost could lead to a lower priced quotation, which could directly increase the chance of the Group winning the follow on sales order.

7 CONCLUSIONS

This work provides important aspects relating to engineering project management in order to identify the usefulness of using risk management software as an effective project management tool. The primary deliverable of this research is to highlight that project managers can take more effective decisions when supported by the right tools and techniques for leading a project to success.

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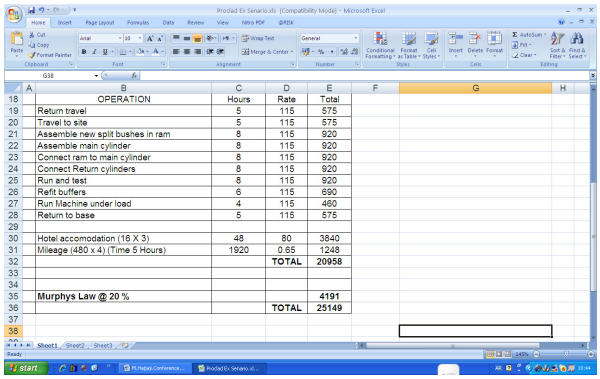

	OPERATION	Hours	Rate	Total
19	Return travel	5	115	575
20	Travel to site	5	115	575
21	Assemble new split bushes in ram	8	115	920
22	Assemble main cylinder	8	115	920
23	Connect ram to main cylinder	8	115	920
24	Connect Return cylinders	8	115	920
25	Run and test	8	115	920
26	Refit buffers	6	115	690
27	Run Machine under load	4	115	460
28	Return to base	5	115	575
29				
30	Hotel accomodation (16 X 3)	48	80	3840
31	Mileage (480 x 4) (Time 5 Hours)	1920	0.65	1248
32			TOTAL	20958
33				
34				
35	Murphys Law @ 20 %			4191
36			TOTAL	25149
37				
38				

Figure 1: The current criteria for producing a quotation

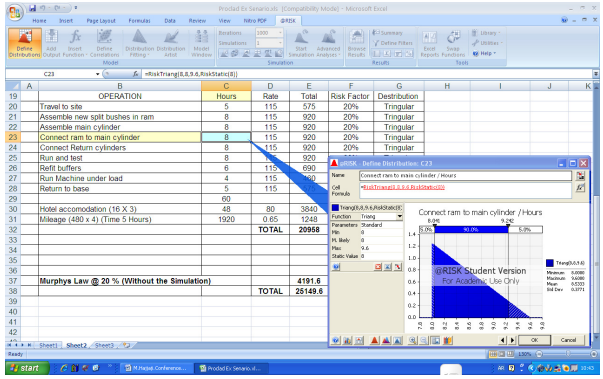

Figure 2: The process of assigning inputs in the simulation

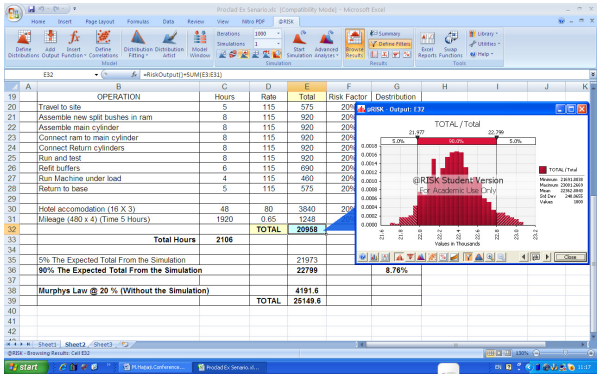

Figure 3: The result of the estimated final cost of the project

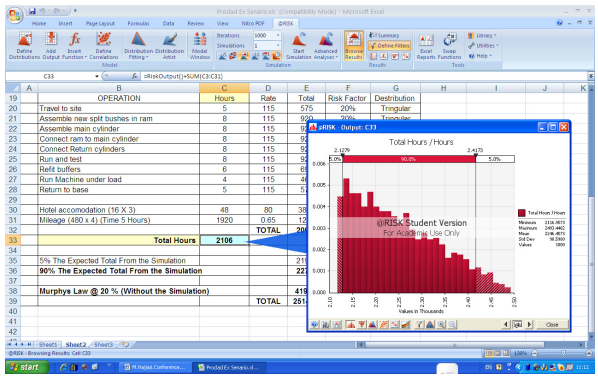

Figure 4: The result of the estimated total hours for finishing the project

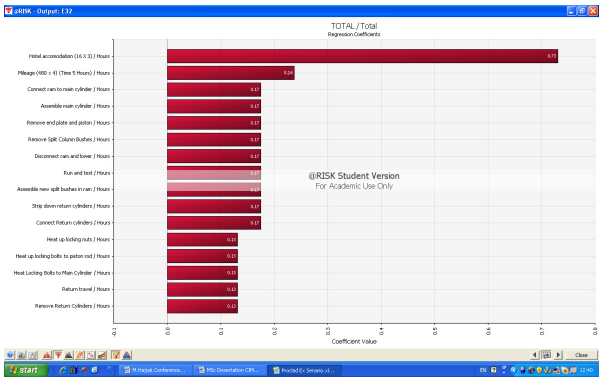

Figure 5: The most significant regressions in the projects

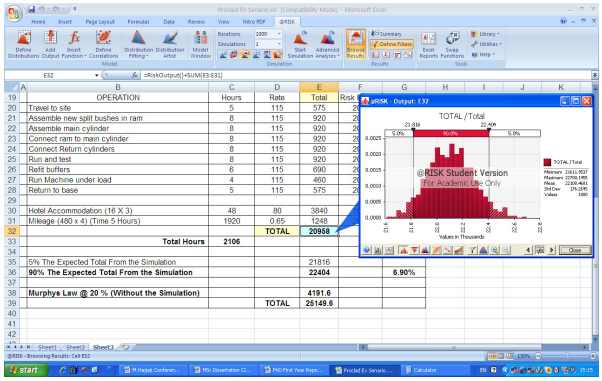

Figure 6: The result of the estimated final cost of the project after taking control of some tasks