

The Impact on Project Success of Using Technology in Modern Project Planning and Control

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Abstract

This paper examines the impact the use of technological tools for project planning and control have on project success. The paper is based on data and conclusions from two earlier international studies involving a wide range of project types and respondents with different stakeholder perspectives.

The first study concluded that evaluating project success tended to use rather narrowly focused measures such as achievement of intended outcomes in terms of specification, time and budget. Whilst this was widely accepted as appropriate in early writings on project management, the project concept has shifted and a broader set of outcome measures had become necessary, among those the concern about lifetime value of the project endeavor, the notion of the sustainable enterprise, the growth in interest in knowledge building and learning as a source of competitive advantage, and long term risk apportionment.

The second study was based on the observation that measures used to review and reward project management behaviour had an impact on that behaviour. One should therefore be careful when selecting what means and methods to use when executing projects. One activity which in this respect is commonly regarded as an important predictor for project success is the use of advanced technical tools in the planning and controlling of project work.

The research questions in this paper is first if the use of technical tools today has the desired effect on successfully completing projects within the traditional parameters of time, budget and quality, and then if perhaps other today recognized as important project success criteria are benefiting, or not, from the use of technological tools.

By running a statistical analysis on the database from the first study above of close to 300 Norwegian projects, the conclusion is that the use of appropriate technological tools in project planning, follow up and control clearly is beneficial for project success. However, using the results from the second study, it was disclosed that the impact varies, in the sense that for some criteria the impact is strong, while for other criteria, some of them traditionally regarded as the most important for judging projects success, the impact was insignificant and questionable. One should therefore clarify which success criteria most important to pursue in a project before deciding the level of technical support implemented.

Key words: *Project success criteria, project success factors, predictors of project success, use of technical tools.*

Background

Project management is for many regarded as an engineering discipline, and the project approach a technical endeavour. Tools for better technical mastering of projects have accordingly been developed, and computer software for this purpose has got widespread recognition and use.

Today projects are, however, used for many other purposes than solving technical problems. They are also venues for mastering business and change both in the long and short term perspective. Since these are important aims of modern projects and project management, the attitude amongst people to what to focus on in order to run projects successfully is an important matter. In a study by White and Fortune(1), they found that out of 236 projects studied in the UK in 2001, 44 could be classified as actually initiated to enhance “business change” or enabling “reorganization” being done better. They also found that many projects, despite being quite technically orientated, had many both desirable and undesirable side-effects. The most common desirable ones were that the project “increased business opportunities (34 projects), “gained new knowledge (25 projects), and “improved business relations” (18 projects). On the undesirable side 15 projects reported “undesirable conflict or impact”.

In terms of society project management is obviously not constituted with techniques only. The interaction level and contribution to society is growing, and so is the view on what constitutes project success. That is why the newer theories say (Almeyda(2)), that good project managers should not only be very good in calculations and statistics, they have to be good also in disciplines such as strategy, sociology, psychology, and be very well aware of the area within which the project and its results will operate. The question is if technological tools are the best means for improving success in all of today’s important project success areas.

Project success

There is a long held assumption that both line and project managers could improve their performance if they had a better understanding of what constitutes project success, and how factors under their control impact on outcomes. Despite all efforts to make projects more successful, however, the failure rate is surprisingly high. A reason could be that project success still is narrowly measured as achievement of intended outcomes in terms of specification, time and budget. Whilst this was widely accepted as appropriate in early writings on project management, the project context has shifted and it seems now to be recognized that a broader set of outcome measures is needed (Pinto & Slevin(3), Pinto & Slevin(4), Wateridge,(5), Jaafari,(6)).

Factors which have led to this view include the growing concern about lifetime value of the project endeavour (Merwe,(7)), the notion of the sustainable enterprise (Kanter,(8)), the growth in interest in knowledge as the source of competitive advantage (APM, 2000 (9)), the emergence of BOOT contracts and other vehicles for long-term risk apportionment (Antilla, Arto, & Wallén,(10)). Projects are accordingly today less viewed as isolated sequences of events aimed at a short-term goal and having

limited impact but rather more as long-term strategic programs which to be accepted have to enhance the economic, social and environmental well being of the various project stakeholders.

The original studies

Two initial studies done in 2000 and 2006 constitute the background material for this study;

- 1) A questionnaire originally developed for testing progress of individual projects by comparing answers to 70 statements using a database of 529 international projects answering to the same statements. The questionnaire was called PEVS, Project Evaluation Scheme (PEVS) (Andersen & Jessen(11)).
- 2) A later in-dept analysis of the same database in order to reveal if there were underlying success criteria and success factors that were more fundamental for project managers to understand and take into account when running projects (Andersen, Jessen, Birchall and Money (12))

The answers to 1) above were recorded in a scale ranging from “completely agree”(6) to “completely disagree”(1), and by computing the averages within 5 steps of project development, each with 6 sub-statements, a relative progress profile could be produced. The following aspects of project work were covered in five steps through 60 statements:

- *Scope*, i.e. project mission (6 statements), goals and terms of reference (6 statements)
- *Planning*, i.e. global (6 statements) and detailed level planning (6 statements)
- *Organization*, i.e. formal (6 statements) and informal (6 statements) project organisation
- *Execution*, i.e. activities (6 statements) and decisions (statements)
- *Control*, i.e. financial and technical control (6 statements), as well as internal and external communication (6 statements)

The final 10 statements comprised the following kinds of project success criteria:

1. The project will finish or has finished on time
2. The project will finish or has finished within budget
3. The project will meet or has met its planned quality standard
4. The project participants have learned a lot from this project
5. The project participants will be motivated for future projects when this is or has finished
6. The experience gained through this project will be or is discussed in a special meeting or in a final evaluation report
7. All relevant documents from this project are or will be compiled in a separate report or file
8. The project organisation is or will be dissolved professionally when terminated
9. The project's end product is already or will be made use of as planned or assigned

10. The project is or will be regarded as a success by all participants

The 10 success criteria reflect both the immediate short term and predefined project goals (completion on time, to budget, and within specifications), as well as the longer-term contribution to organisational health through programs and portfolios. The latter results from the project's on-going contribution to organisational success as well as through development of capability which is commonly agreed to create “competitive advantage”(Porter(13), Stutz & Warf(14)). Another dimension of success emerging relates to the extent to which learning is captured in both tacit and codified formats, an important ingredient when preparing for future assignments as well as for satisfying stakeholders on project completion. From the earlier studies by Argyris & Schön (15) to later amendments by, among many, Nonaka, Ikujiro & von Krogh (16) and Bontis & Serenco (17), organisational learning (OL) has been recognized both as very important but at the same difficult to identify. A learning organization seems to be one that actively creates, captures, transfers, and mobilizes knowledge to enable it to adapt to a changing environment. Thus, the key aspect of organizational learning is the interaction that takes place among individuals, which is typical for projects.

The success criteria above appeared after this to offer a good balance between the predetermined intention, the immediate benefits of project success and the longer-term strategic contribution to the health of the organisation.

The second in dept analysis, 2) above, using Factor Analysis SPSS version 10.0 identified 3 overall success criteria which were named;

- (1) *project management success*, which reflect the immediate short term and predefined goals (completion on time, to budget and within predefined quality parameters).
- (2) *learning or captured experience*, which is emerging to the extent to which learning is captured in both tacit and codified formats, and important ingredient when preparing for future assignments as well as for satisfying stakeholders on completion.
- (3) *top management* or high level project success, which include the project's on-going contribution to organizational success and health as well as development capability.

All these 3 criteria seem to be closely connected to motivation and rewards at different stakeholder levels. The advantages of the “project approach” are well known (Jessen (18)), especially its efficiency in managing limited resources and reaching predefined goals (Meredith & Mantel (19)) and its healthy tendency to propagate itself under changing conditions” (Lord & Birchall (20)).

The conclusions from these two studies were in brief the following:

1. Where the aim is to achieve a balanced set of short term and long term outcomes, an emphasis should be placed on tight execution and rich information sharing. In other words a willingness for project management to keep close control, but at the same time listen to others and

have confidence to take action when appropriate. But whilst the technical control factors lend themselves to a strong degree of measurement, other control factors had to be assessed differently than through traditional quantitative scales.

2. Clear responsibility and control had a clear bearing on captured learning, but little impact otherwise.
3. During operations there seemed to be less concern for the overall strategic impact as the focus is on project endeavors to achieve more immediate outcomes. This may discourage important project success criteria such as the usability of the end result, the motivation amongst project participants to involve in further project work, and the overall impact of the project for its base organization.

The present research

The research in this paper is limited to the impact the use of technology in project planning and control has on project success. The research is further limited to data from the Norwegian part of the population consisting of 277 persons in the database above, who were all in positions of authority in relation to projects - as project manager, in a high level support function, as project champion or as the client.

The research was done by adopting a quantitative approach with the objective to examine the relationship between two quantitative predictors from the PEVS form denoting the use of technological tools, and the 10 variables above recognized as representing success criteria of modern project work. Of the 60 statements used to describe the status of the investigated project, two statements were selected as potential predictors because they directly pointed to the use of technology. They were the following:

Statement A (Statement no 24 in the PEVS database):

"Adequate planning tools or similar are used in a good way in the project planning process"

Statement B (Statement no 49 in the PEVS database):

"Project control is executed by good managerial and technical tools"

Both statements are quite broad in the sense they do not ask for what kind of tools used. This is a weakness, since many opportunities today exist, from advanced software planning and controlling techniques such as MS-project, Prima Vera and Artemis, to mention only a few, to simple spreadsheet techniques. On the other hand will a general statement reveal if techniques tools were used at all, and therefore point to some effects using them. Using only these two statements as predictors of success and the 10 success factors as dependent variables, the result of the computation using SPSS 15.0 ANOVA and B-coefficients for the Dependent Variables, are shown in Table 1 and 2 below.

The following can be recorded:

1. The immediate observation from Table 1 is that the mean values of 3.28 and 3.26 are amongst *the lowest of all the 60 statements answered to with*, rankings 55 and 57 respectively. Only two statements about project planning and four statements on control got lower scores. The two planning statements at the bottom of the

list were about the strategic thinking behind project selection, and about inspection rules for project plans. For control the statements at the bottom with lower score were about professional use of handbooks or project manuals, professionalism in dealing with plan deviations, and active use of consequence analyses. A mean value of just around "3" implies according to the respondents *the statement is neither disagreed or agreed to, one is generally quite indifferent to which extent technology is used favorably or not in projects*.

2. The first observation from Table 2 is, however, that despite a comparably lower mean score on the use of technical tools in project planning and control shown in Table 1, *the impact is significantly positive on 6 of the 10 success criteria described*. Split into the computed 3 overall project criteria, use of technology has a positive, significant impact both on project management success, top management success, and project learning.
3. As for the impact on the traditional criteria for project success, within time, budgets, and quality specifications, *only time is significant positively impacted*. This impact is, however, strong, with a sigma value of 0.000 and B-values of 0.21 and 0.26 respectively. The other important observation, however, is that *the use of technical tools in planning and control have no recognized impact on projects keeping budgets and delivering quality*. If the aim of the project effort is to deliver quality within set budget parameters, one should look for more diversified means for planning and controlling the project.
4. The learning effect of using technology is surprisingly high, in the sense that both *direct and indirect learning* through documentation and other kinds of codified formats is *significantly and positively influenced by the use of technology*, B-values ranging from around 0.20 to 0.25.
5. *"Management success" is significantly positively influenced by the use of technology*, especially their opinion about professional project termination, and their general opinion about project success. For the positive impact of technology and the usability of the end product, the significance is different, in the sense that it seems only in the control phase top management recognize a positive, significant effect, which this is not the case for using technology in the project planning phase.

Table 1: Mean values with their standard deviation for the two independent variables:

<i>Statement A: Adequate planning tools or similar are used in a good way in the project planning process</i>		
Mean: 3.28	Stdv: 1.786	Rank: 55

<i>Statement B: Project control is executed by good managerial and technical tools</i>		
Mean: 3.26	Stdv: 1.663	Rank: 57

Table 2: The correlation between the two independent variables and the 10 dependent variables

Predictor Dependent		R square					Std.error		B		Sig	
A	Time	1	0,036	1,9788	0,213	0,002	B	1	0,047	1,9706	0,262	0,000
	Money	2	0,004	2,1431	0,079	0,285		2	0,025	2,1209	0,202	0,010
	Quality	3	0,008	1,7759	0,088	0,151		3	0,008	1,7766	0,094	0,153
	Learning	4	0,026	1,5385	0,141	0,008		4	0,050	1,5171	0,209	0,000
	Motivation	5	0,052	1,7771	0,233	0,000		5	0,021	1,8065	0,157	0,018
	Experience	6	0,039	1,7596	0,199	0,001		6	0,032	1,7664	0,191	0,003
	Documentation	7	0,058	1,7917	0,249	0,000		7	0,037	1,8055	0,213	0,001
	Org. dissolvment	8	0,033	1,7630	0,184	0,003		8	0,042	1,7524	0,220	0,001
	Use	9	0,007	1,4706	0,070	0,168		9	0,029	1,4515	0,150	0,006
	Overall success	10	0,048	1,7051	0,215	0,000		10	0,015	1,7298	0,128	0,046
The Project Planning Phase						The Project Control Phase						

Conclusion

As propagandized by Gray (21), and later pointed to by Bushell (22) and many others, the climate or atmosphere of an organization is likely to have a strong effect on its performance. Many companies are not able to handle their projects equally well. It would be of strong interest to top management and to project support agencies to know in advance how well their organization is prepared to use projects to address present and future endeavors. It should be of vital importance in this respect to know when and where the use of more or less advanced technology for project planning and control is really beneficial.

In our research we have found that:

1. In general terms, *the use of technology when planning and controlling projects has a significant positive impact on many of today's project success criteria*. One should therefore inspect every possibility to introduce adequate planning and control tools in all modern project endeavors.
2. The original tools for project planning and control were CPM – Critical Path Method – and PERT – Program Evaluation and Review Technique. In their modernized forms as advanced computer software today they are still very important tools for making good project planning and control systems. But such tools were originally made for keeping projects *on time*, which seems still to be their most valid contribution. However, *if the main aim is to keep the project also on budget and completing within predefined parameters of quality, use of such tools seem not to be recognizable contributors*. PERT and CPM related tools seem therefore to be more of a necessary, but not sufficient characteristics of modern project management.
3. Use of technology in general in projects has a significant, positive impact on what and how people *learn* from project work. Both the direct, individual learning and the codified more indirect learning coming

from documentation and stored project information, are of vital importance for *knowledge building* in projects. If the main purpose of the project endeavor also is to enhance people's ability to run future project better, and with higher motivation, use of technology both in the planning and the control of projects might be a good investment.

The research was at this stage limited to Norwegian projects, further was only two predictors of project success investigated, those which in previous research endeavors were most easy to identify as tool oriented. Future research within this area is highly recommended, by extending the number of statements about use of technology, and extending the population to projects in different cultures in order to give more international recommendations on how, what and when the use of technological tools should be encouraged or modified in order to improve the full range of project success criteria important today.

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