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Controlling a multibillion project portfolio - milestones as key performance indicator for project portfolio management

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Abstract

Different studies show that projects tend to be delayed. For one project this is a challenge, but for the portfolio manager managing hundreds of large projects, delays can add up to significant problems. This case study is based on data measuring more than 2000 milestones over a period of more than six years, covering a multi-billion dollar business that runs 200-300 large projects every year. This paper will address strategies for governing portfolios despite delays. Analysis of the milestone delays show reoccurring patterns, which is made into information used to govern. In the five different business areas analysed, the pattern of delays were found to be similar. The curves showing relative milestone achievement repeat themselves year after year, producing tendency curves. Since the portfolio manager expects this behavior he uses the information to govern the project portfolio cash flow. The data are unique, but we think the measured tendencies indicate some sort of global tendencies. Despite relative large delays in the portfolio the portfolio manager manages to meet the budget. Success on project level is not necessarily the same as success governing a portfolio.

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1. Introduction

Delays in projects are a global phenomenon and have become a typical part of the project manager's concern. Projects are delayed for a variety of reasons. Zidane et al. (2015) lists a number of reasons mentioned in the literature. Articles discussing delay factors—suggest that reasons often are more external than internal. The articles surveyed (ibid) point to reasons such as construction environment, working cultures, management style, methods of construction, geographical condition, stakeholders, government policy, economic situation, and availability of resources, to name a few. This paper is based on objective data analysis and looks into inherent problems that project managers often face. The article is based on the fact that delays in a large portfolio can be foreseen and strategies to govern the effect of delays can be implemented.

It is often said that project managers are too optimistic and that their plans seldom outlast the first encounter with reality. This can be a reason for delays and failure in time estimation. The problem has been widely studied and many different explanations have been offered (Buehler et al., 1994; Flyvbjerg et al., 2009; Newby-clark et al., 2000). Underestimation in order to make the project “sweeter” is one angle (Flyvbjerg et al., 2002). Uncertainty theories or Project Risk Management is another angle. Another explanation can be a phenomenon called; “the planning fallacy”, under which plans tend to be biased towards the optimistic in terms of how much time is required to complete. Plans are uncertain and are likely to be changed. If we see this in the context of governing a portfolio, we know that most governmental organizations, and many others, govern their business based on a yearly budget planning cycle. Organizations with many projects often organize them into portfolios and programs in order to reduce risk and increase the ease of governance, in order to meet their yearly budgets. When it is likely that plans will be delayed, this will cause challenges for the portfolio manager aiming to stay within the yearly budget. The PMI report “Pulse of the profession” conducted a global survey addressing average project delays in 2012 (PMI's Pulse of the profession, 2012). Projects in mature project organizations reported that an average of 67% of projects were on time, whilst non-mature organizations reported that an average of 39% kept to their schedule. Delay issues, planning and time management have been central topics for many years. Scientific management / Taylorism focus on analyzing workflows (Taylor, 1914.). PERT (Raborn 1957) and CPM (DuPont 1957/59) techniques are well known instruments for project time planning (Morris 1987). Measuring and managing time is a core skill in project management and in scientific management, but little data exists on how a large system, or project portfolio, reacts year after year.

In our study we followed 415 projects and their milestone delays over a seven-year period, with baseline/actual dates for 1531 portfolio-level milestones. The tendency of delays followed the same pattern every year, a pattern we find unique and interesting. The average delay in the portfolio was approximately 40-50 % by the end of the year. A central question is therefore; which metrics or what kind of information can provide us with the right tools to govern a large portfolio to meet the budget? In this study the portfolio managers hit the budget target within 2 % with a total average of 40 % milestone delay in the portfolio. We will discuss our findings, theories, the milestone patterns and the strategies that are used to govern the portfolio towards a yearly budget. Success in portfolio management is not necessarily the same as success in project management (Blomquist and Müller, 2006; Martinsuo and Lehtonen, 2007; Müller et al., 2008; Teller et al., 2012).

2. Methodology and research approach

The study came about due to the opportunity to analyze a large dataset of project milestones from several hundred projects. The data covered every deviation on milestones over a seven-year period. Milestone achievement graphs showed reoccurring behavior year after year. We could not explain what the data showed us and we could not explain the reoccurring “trends”. The analysis of the data was therefore followed up by several interviews of the portfolio management team.

The study is based on data from a Norwegian public body with a project investment budget in excess of one billion USD/year. The portfolio is heterogeneous in the sense that it contains a range of different projects from varying widely in size and nature. All projects are conducted according to Norwegian public acquisition rules. The study is based on data from the project planning system, which is provided directly by the project managers

themselves. Since 2008 a total of 1531 milestones have been counted and tracked. Our findings may lead to raise further questions about correlations, big versus small, complex versus simple and so on. This is not addressed in this paper but will be studied further. We have focused on the macro tendencies that the portfolio manager uses for portfolio governance. The study is limited to projects in the acquisition phase. In order to get to this phase every project has been through a decision gate and formal quality check. They have broad documentation, risks are addressed, buffer is calculated and all other relevant data for funding the project is in place.

3. Theoretical framework – Project portfolio management and uncertainty in planning

Performance indicators like the cost performance indicator, schedule performance indicator, earned value and others demand a detailed plan in order to provide the correct information. Project plans are often a combination of many stakeholders plans. In our case the project organization is a middle body between external project organisations or suppliers and the users. The plans measured in the study is based on activities formulated in contracts and plans in the user organization. The plans have milestones that are fixed to a baseline formed at start of the year.

As mentioned in the introduction, projects are frequently delayed (PMI's Pulse of the profession, 2012). When this is likely but uncertain, strategies to limit the impact should be applied. It has been claimed that the project's real uncertainty can be estimated objectively while the project is in progress, but it can only reasonably be considered in an objective manner after the completion of the project (Christensen and Kreiner 1991). How uncertainty is assessed in a project is influenced by individual events that the project organization experiences. However, it is also affected by how the various members in the organization interpret both internal and external events, and by the elements that the project owner and society place emphasis on while the project is carried out. The project owner and the project management have different roles and thus different perspectives on what issues for the project attract uncertainty (Olsson et al. 2008). Langlo et al. (2007) discuss six dilemmas between the project owner and the project leader. This will also affect how the project's uncertainty is evaluated and presented. Both the project owner and the project manager have their subjective perceptions of the uncertainties that the project faces and they will interpret the information that is available throughout the course of the project differently. It is up to the project owner and the project management to decide who will focus on which areas of uncertainty. It is up to the owner to decide whether the project management should look beyond the project objective and whether responsibility for functionality and for future needs should be included in the mandate of the project management. Without guidance from the project owner in this matter, one can expect that the project will focus on uncertainty management based on the project's objectives and not based on its effects.

When governing a portfolio of hundreds of projects you must choose the focus areas for reporting on every level of the portfolio. The portfolio in this study consists of more than 300 projects with their own objectives and uncertainties. Every project must assess uncertainties and assess effect on time, quality and cost. Uncertainty have been a focus area for project managers and owners for a long time. There are many factors that cause uncertainty and eventually delays in a project plan. It can be variability associated with estimates, uncertainty about the basis of estimates, availability of resources, uncertainty about objectives and requirements, uncertainty about priorities or about fundamental relationships between project parties. All areas of uncertainty are important and generally they become fundamental to project performance (Chapman 1997; Chapman & Ward 2011). According to Simister (2004) the risk management process should be commenced as early as possible in a project life cycle, and the process should be undertaken on an iterative basis since each assessment is a snapshot in time. In our case projects must assess uncertainty every month.

Most of the aforementioned work had a single project focus and provided little or no guidance on how uncertainty should be managed at the portfolio level. Many others have studied trends in large numbers of projects (Morris & Hough, 1987; Flyvbjerg et al., 2003; PMI, and other organizations). Others have studied cost and time overruns. Scientists and writers (i.a. Atkinson 1999; Miller & Lessard 2001; Shenhar & Dvir 2007; Rolstadås, Hetland et al. 2011) tend to think that the governance criteria for a portfolio or program vary from organization to organisation. The theory on portfolio management focuses on how to organize the portfolio and gives us little insight into expected behavior. Other standards like the Management of Portfolios (MoP) do give advice to be

applied. We find that theory and standards on portfolio management suggest that the governance of the portfolio must correspond with business strategies, reduce risk, and that the key metrics applied must correspond with the business strategy.

Governance and governance theories are much discussed. In Norway the government has implemented a framework for quality assurance of public mega projects. These quality principles have spread and the framework is a part of public governance of projects. Klakegg (2010) gives a long list of governance principles and structures and points out that it is the embedded governance principles that are most important. In our case, they are assessments of time and cost in every project. Where the deviations and forecasts are fundamental to govern. And the principles of transparency is followed to achieve data quality (Müller et al., 2014) but also formalization (Teller et al., 2012) are adhered to. Project managers must be open about their reporting and the reporting system should be as transparent as possible in the vertical axis from top management to the project manager. Transparency will enhance the availability of real information all the way. But it is how this information is interpreted, analyzed and made into governance knowledge that is important. In our case the reporting system is transparent, every manager on every level can access information, but the information on the total delays, trends and macro data cannot be seen by anyone but the portfolio manager, who makes the status reports to the strategic decision maker. The portfolio manager has a central role in the management of the portfolio (Filippov et al., 2014).

Despite project delays in a portfolio, we think that strategic business goals can be met with the right governance. We believe that success or failure on the project level is not necessarily the same as success or failure on the portfolio level. A number of studies on projects and textbooks place the fact of optimism in plans; this is more or less the “law”, and the phenomenon can be the “planning fallacy” (Buehler et al., 1994). Projects in a portfolio will be delayed. When, and by how much, is hard to forecast. Our focus is how to govern the portfolio within a given budget, with the knowledge that projects will be delayed. What kind of metrics can be used as early warning signs for the portfolio manager?

4. The portfolio and study framework

In our case the projects are organized in five different business areas. Projects within the portfolio can take many years, due to the long lead times in public procurement. In the study, projects and milestones are counted as absolute numbers and can be present in the complete survey period. All projects have one or more external contracts and they are governed by the same set of rules. They must follow the same decision process, develop the same project documentation, carry out the same risk assessment and report monthly in the same system. Every project goes through a long planning phase; the definition phase; here risks concerning cost, objectives and time are addressed. When the decision is made to fund the project it goes to the acquisition phase. The data in this study is gathered from the project management system during the acquisition phase only. The milestones are individually decided and project managers endeavor to be as realistic as possible because they are a part of the strategic governance reporting system. The first step in the acquisition phase is about checking and preparing. Mandates, funding and resources are checked before an updated project plan is laid out and the program milestones are defined. The budgets and plans for every project are reassessed in January or February each year and new baselines with new milestones are introduced for every project. Within the survey period a common strategy has been to allow project managers a certain amount of free reign, allowing them to get ahead of their deadlines. The ability to over-perform this way is overwhelmingly seen as positive.

Key Performance Indicators can vary between different companies and project phases. This study focuses on how this portfolio is governed in the acquisition phase. We think one of the fundamentals of governing a large portfolio is to establish a tight and formal reporting system (Teller et al., 2012). The strategic target for this portfolio is to keep within the budget. The objective is to use the budget as efficiently as possible, to ensure adherence to the budget, knowing that some of the 415 projects will be delayed; is the job of the portfolio manager. The portfolio manager’s team follows deviations from the baseline week after week.

Approximately 80% of the projects in the portfolio are within a range of 2 million USD to 75 million USD. The portfolio was in average 392 (span 324-473) running projects per year. During the period, 241 projects have been completed and delivered their termination reports.

To govern a portfolio of more than 250 projects you must have information from the projects and experience of the behaviorism of the portfolio. This is obtained from years of experience and through a transparent reporting system. The principle of transparency is important to improve confidence in the data (Müller et al., 2014). The yearly budget is set as a new baseline in January. The five business areas each have controllers who follow their own projects within the business area in every detail. The portfolio manager at the top level follows every project on a few selected performance indicators, which are reported through the project management system every month. The role of the portfolio manager is to be a strategic advisor and a detailed data analyst. The monthly report should give an economic forecast for the current year with uncertainty estimates. Deviations and uncertainties on budget, resources and time must be assessed and classed in red, yellow or green flags. The portfolio manager is the key to understanding the behavior and advising the right course of action. This corresponds with Blomquist et al. (2006) and Filippov et al. (2014) who discuss the role of the portfolio manager.

A Key Performance Indicator is progress reports on defined milestones. These defined milestones are called “program” milestones and are monitored by the portfolio manager. A delay in one will indicate lack of performance and possible barriers to meeting the forecasted payment plan. These milestones are categorized as decisions, deliveries, payments, and others. It is mandatory to report on these. Projects will, in addition to these high level milestones, have their own internal milestones, which are used by the project manager for internal governance. The key performance indicators for ensuring the portfolio stays under budget are the economic uncertainty forecasts and the program milestones. Every single delay is measured and the total delays from several hundred projects give a total arithmetic mean milestone achievement for each month. The trends for milestone achievement are plotted every month to assess progress throughout the portfolio.

This is the key element of this study. Several hundred projects are condensed into one single figure, the mean relative milestone performance. At the start of the year it is likely that projects will achieve the planned date for their milestones since the plans for all projects are reassessed in January to February and as time goes by, delays are more likely to occur. The milestone characteristics are shown in Figure 1. If the mean achievement is better than planned, meaning work is ahead of schedule, the figure is higher than 100 %. If delayed, the figure is lower than 100 %. The figure shows that the behavior is reoccurring, more or less.

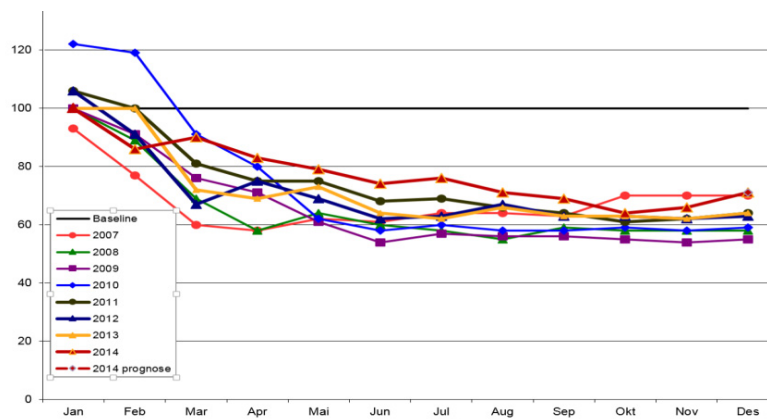


Fig. 1. Trends of the delayed milestones, year 2008-2014.

The curves show relative milestone delays during the period of the survey, for each of the 7 years. The figure shows that delays in milestones are minimal at the start of the year, but then delays occur and milestones achievement falls down to a level of approximately 60 % to 70 %, giving a mean per year in the period of 71 %. The portfolio is divided into five business areas that are more or less autonomous, except for one that delivers ICT systems to all other areas. The curves represent all areas. Many claim that ICT projects are different and encounter larger problems in project performance than other projects. Based on the assumption that ICT projects are problematic, and public ICT projects often are claimed to perform poorly (Leydesdorff et al., 2000; Holgeid, 2012)

we should see a different delay pattern to the milestone graph. We have analyzed the data and compared; ICT project portfolios do have the same trend curve as the other areas (average performance of 69%, with the other business areas delivering 68-78%).

What we believe is of interest is the reoccurring trend and shape of the curves. The number of projects in this study, the magnitude of data, and the duration of the survey result in these curves. It can be hard to explain exactly why the curves are as they are.

It is crucial that this behavior is well known to the portfolio management team. This makes it possible to implement the right strategy to govern the portfolio. The portfolio management team cannot explain the reoccurring trends but they are at least familiar with their nature. We performed 12 hours of interviews to drill down into detail on governance strategy, behaviour of milestones, reporting, and so on, in order to better understand the phenomenon of the reoccurring curves. As the deviation between the planned performance and the actual performance is possible to foresee, action can be made long before the budget year. To enable budget control, the portfolio manager assesses the flexibility of contractual payouts and plans a so-called over-height plan. The over-height plan is the most important instrument in hitting the budget target. The portfolio management team decide more projects than the yearly budget because delays will move a part of the payment milestones to next year. The portfolio manager can move funds between the business areas but is more or less locked to the overall budget set at the start of the year. To decide the right size or the magnitude of the over-height plan the team uses knowledge based on years of experience. This is proactive uncertainty management of the economic performance of the portfolio. As a rule of thumb, an over-height between approximately 14-18 % is common. For the portfolio manager, the delay curves indicate that a deviation from the budget is most likely to occur in April / May. If the milestones do not appear as expected, it is a warning sign and reasons will be exploited. Without the over-height the financial target will not be possible to reach.

This case study shows that this portfolio consistently performs good schedule adherence compared to the mature project organizations reported in the survey PMI conducted 2012. Why the curves pan out as they do in Figure 1, and are repeated in this particular way is likely to be caused by the rules of project management in the organization, the context, the planning fallacy phenomenon (Buehler et al., 1994) and other factors. It is clear that the plans are optimistic. And it is likely that the milestone data tendencies show a form of organizational over-optimism.

Over-optimism can be seen as a two-sided coin when it comes to project management. On the one side it is about making a plan to motivate resources to perform, on the other side it is the ability to estimate realistically in a world of biases. In our case, project managers must set a new baseline in January; they are asked to forecast 12 months ahead as realistically and feasibly as possible. The curves on the diagram show that the tendencies occur year after year. In 2010 to 2011 a large reorganization took place. The curves were the same but some deviation to hit financial targets occurred due to fewer projects in the pipeline. The curves are so well known in the portfolio management team that it is seen as a rule of thumb, a heuristic of portfolio management. The portfolio manager knows that project managers will not keep up the pace, and therefore makes their own plans with necessary “overheight” allowances to be on budget. Table 1, results from 2008-2012, shows the performance, meeting the budget despite mean delay on the portfolio at approximately 30 %.

Table 1. Deviation from financial target.

Year	Rel. Deviation in budget vs. turnover (%)	No. Projects in Portfolio
2008	0.30%	415
2009	-1.89%	372
2010	-9.12%	360
2011	-16.78%	338
2012	1.34%	334
<i>Total</i>		<i>1819 (incl. overlap)</i>

The table shows the relative deviations from accounting results. The budget size was relatively steady in the period, around 1 billion USD. The underperformances in 2010 and 2011 were, according to the respondents, caused by too few planned projects in the pipeline. The question is, how is it possible to target the budget within a few percent when the whole portfolio, year after year, is approximately 35 % delayed? We have identified the most important strategies to be; (1) Plan with overheight, (2) Observe the reported milestone achievement and economic uncertainty, (3) Find the few large projects with cost flexibility and manage their economic milestones toward the end of the year.

5. Conclusions

The strategic goal is to be on budget. The portfolio manager governs the portfolio based on characteristics which are expected, measured and analyzed every month. Despite delays, the economic target is reached. Projects success is not necessarily the same as success governing a portfolio.

From the case study there are at least two issues we believe should be focused on. The first is the data that shows us how milestones tend to move within a year under the same set of rules. It shows that the portfolio drops to a level of 60-65 % of milestone achievement after 5-6 months, to a total mean of 70 %. For the manager governing the portfolio, this tendency is known and strategies to avoid budget underperformance can be planned well in advance. During the year the milestones give indications if something deviates from the norm.

We believe the curves represent some sort of measure of the optimism bias you will find in projects globally, or a measure of the planning fallacy syndrome. Planning fallacy and optimism in plans are discussed widely but it is hard to find data measuring the tendency in large project portfolios. In this case study the data are unique, but we believe the measurements indicate some sort of global behavior.

The planning fallacy is a fact and the data from the portfolio milestone delays tell the manager he has to implement some strategies to govern the budget. If he plans without overheight the budget target will never be met. The most important strategy is to plan with overheight. The second most important strategy for portfolio governance is to follow the reported deviations on milestones and economic positive and negative risk. The third strategy is to identify the economic flexibility in the portfolio in order to govern the payouts late in the year. We believe that success or failure on the project level is not the same as success or failure on the portfolio level.

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