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Improving efficiency: time-critical interfacing of project tasks

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Abstract

The paper discusses the management of time-critical operations and their dynamic interrelations in project environments. It is well known in theoretical literature that delayed operative tasks generate a cumulative effect, which delays the overall delivery time making efficient time management difficult. However, practising managers seem to be helpless with this phenomenon if judged by the often reported poor performance of project management. To control the use of time, managers tend to plan safety buffers in their operations, which bias the overall planning of projects. The result of all this is uncontrolled and unknown outcome of the whole operation and, even worse, it inherently makes development efforts very difficult to implement, as the true performance of the organization is hidden in the realization of airy plans. Based on case studies in various industrial environments, we propose that project schedules need to be managed by putting special emphasis on the time-use within individual tasks and by ensuring that work proceeds smoothly along the critical chain of tasks. To enable this, high transparency is needed on how time is used in project organizations.

Keywords: Time-based management; Project management; Operations management; Throughput time; Distributed operations; Supply chain management

1. Preamble

A study by the Standish Group scanned more than 8000 projects and compared their anticipated results with the real outcome. According to this study, only 16% of the projects were able to meet the goals set in terms of time, budget and quality [1]. Further on, the project management literature (e.g. [2]) clearly points out that success in project management is often judged according to subjective perceptions:

1. The *Fulmar Oil Field* in the North Sea was late, but extremely profitable for the owner, so it was judged to be successful.
2. The *Thames Barrier* was late and overspent, and was quite badly managed in its early stages, but is a tourist attraction and made a profit for most of the contractors, so it is now judged a success.
3. *Concorde* was late and overspent, but was a technical success, gave France an aerospace industry, and contributed to Britain's entry to the EC, so it is judged to be successful.
4. *Heysham II Nuclear Power Station* was well managed, and nearly on time and budget, but the judgment is clouded by the rest of Britain's nuclear power program, and the public's perception of the nuclear industry, so it is judged to be unsuccessful.

These large-scale examples highlight the rather ad hoc manner how project success is generally assessed. When measured with critical project success criteria — i.e. on time, on budget and delivering what was promised — all the above-mentioned projects were failures, with the exception of the power station.

The underlying argument in this paper is that the ultimate measure of project success is time, which precedes all other measures. Associating the time-management approach with the main problem classes of project failures [3] one can see that time-based coordination plays some role in all problem classes (Table 1).

Juran [4] has defined project as a problem scheduled for solution. This definition highlights the importance of time-based approach in project management. Although the time-management problem has been known for a long time in project management, the essence of using

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Table 1
Reasons for project failures viewed against the time-based management paradigm

Why projects fail?	Relationship with time-based management
Ignorance on what other project teams are doing	Interfaces between consecutive tasks are not coordinated The time-related interdependencies are not mediated between parallel tasks
Lack of discipline in design change control	Parallel processes are not using same procedures making time-based measuring incomparable Plans and schedules are not based on same premises
Diverse views on what are the objectives of the project	Buffering time (and buffering all the safety) in individual tasks bias the true due-date objective of the project
Rigid project planning and scheduling routines	Reallocating time in tasks is time consuming because of resource constraints and politics of defending safety buffers of individual managers and work teams
Poor ability to react on sudden changes in the project environment	Preparations for contingencies generate unforeseen effects, because true performance is diluted in the plans
Unforeseen technological difficulties, excluding *force majeure* situations.	Project baseline is not up-to-date leading to product configuration-related problems in later phases of the project

time effectively does not seem to get appropriate attention in project management practice. Even if the theoretical basis of time-based management is well-known in the project management literature, the actual practice seems to be missing the point in many cases. Through the case studies described in this paper, we want to highlight the critical issues of time-based project management to practising project managers.

Studying how time-based management is applied in every day in project management is the main objective of this article. It consists of four main parts. We start with the research method description and the data used in our research. The research questions for the study are outlined, further formulated into a set of research constructs. Then the empirical cases are presented to probe the practice behind the constructs. The obtained results are discussed and suggestions given for practising project managers. Finally, conclusions are drawn and propositions for future research given.

2. Research method and data

During 1980s and 1990s time was promoted as the prime performance criterion to assess productivity in manufacturing operations [5]. The time-based management literature [6–12] has highlighted the importance of timely and well-concerted operations to achieve faster throughput times resulting in rapid and accurate deliveries. [13] describes how time has become one of the most important sources of competitive advantage in manufacturing industries. He describes the background for the "Japan's secret weapon" or "lean thinking" [10] by illustrating how the competitive advantage of Japanese manufacturing industry evolved from low labour costs-through scale — based strategy, focused factory and flexible manufacturing — to time-based competitive advantage.

Following the theory of constraints and its later enhancement on project management [14,15], the focus of this research is on management of implementation time in individual project tasks and the critical chain of tasks scheduled around the effective use of resources. According to [15] the traditional critical path method of scheduling is too narrow and often ignores the appropriate planning of bottleneck resources — particularly in the multi-project environment. Goldratt suggests, like in his earlier work in manufacturing, that the use of bottleneck resources should be taken as the basis for scheduling. Scheduling is traditionally based on average experienced implementation times of tasks including the used or non-used safety buffer in the tasks. This results in wrong use of safety in project schedules. The embedded uncertainty in tasks is naturally known to experienced project managers/employees, who mentally rely on the buffered safety when executing their project tasks. The reality tells that despite the safety existing in project plans, project implementation overruns the estimates. This is the very paradox that time-based project management is confronting. On the one hand there is buffered safety, which should enable timely completion of the project. On the other hand it is the flawed use of this safety that often causes delays and discrepancies between expected and real outcome.

According to the time-based management paradigm, companies are considered as systems with competitive advantage achieved by breaking the "debilitating loop strangling traditional manufacturing planning" [13]. Traditional manufacturing required long lead-times to resolve conflicts between various jobs or activities that require the same resources. The long lead-times required sales forecasts to guide planning. Long lead-times made the accuracy of sales forecasts decline. Forecasting errors increased inventories and the need for safety stocks at all levels. Errors in forecasts meant more unscheduled jobs in the production line, increasing the