Time to market vs. Time to delivery

Managing Speed in Engineering Procurement and Construction Projects

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Abstract

The time to market in NPD projects is a key factor in the competition between innovative firms. Research on concurrent engineering has shown that time can be managed as well as a delay and as a speed.

Our concern in this paper is to study the time factor in the case of Engineering, Procurement and Construction (EPC) projects, where a customer initially contracts for a project from a contractor on the basis of specifications, budget and delay. Is time-to-delivery a key factor? Does its reduction represent a competitive advantage for the client and/or for the contractor in EPC projects? Is project speed a key variable to be managed, or does it result from other project parameters?

We first define an analytical model to characterize a speed profile in EPC projects. We implement this model for six major construction projects developed by a large, international firm. A variety of speed profiles result.

We conclude by showing the relevance of NPD project speed management in EPC projects.

Key Words: project management, time-to-market, time-to-delivery, speed, Engineering Procurement and Construction (EPC), speed profile, construction, concurrent engineering
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Introduction

Since the end of the 1980s, the time to market of new products has become a competitive advantage, particularly in markets where the first mover has a strong advantage such as in the computer industry (Stalk [13], Cordero [6], Brown [1]). Speeding up NPD projects in these markets reduce costs and create value.

Our concern in this paper is to study the time factor in the case of Engineering, Procurement and Construction (EPC) projects where a customer contracts for a project from a contractor. 

Time management in EPC projects has principally been studied from two different perspectives:

- an instrumental approach based on tools for optimizing and identifying critical pathways, achieving the project planned delay (Clough [5]; Chelaka [3], Callahan [2]) and explaining the project duration (Dissanayaka [8], Leu [10]).
- an organisational approach that explores the limits of these tools or the difficulty of integrating them into the project structure.

Our aim is to study time management in EPC projects from a strategic perspective. Is time-to-delivery, which is the delay between the beginning of the project and the handing-over of the product by the contractor to the client, a key factor for EPC projects as the time to market is for NPD projects in innovative competition? Does reduction in time-to-delivery represent a competitive advantage in EPC projects? What does speed represent for these projects? Is it a dependent variable resulting from other parameters of the project? Can it be managed and driven?

In order to study speed in EPC projects, we propose the concept of project speed profile. We implement this concept for six major construction projects developed by a large, international contractor¹. The criteria for choosing these projects were that they had to cover a variety of situations based on the following variables: type of work (building, road construction, etc.), type of contract (fixed price, unit price, incentive clauses, etc.), composition of the group in charge of the project (foreign partners, joint venture, etc.) and location of the project (domestic or international). In each case, a case study was drawn up and approved by the project participants. These case studies were based on an analysis of existing documentation, visits and interviews with a wide variety of those involved in the project at different hierarchical levels (project chief, design engineer, works clerk, general foreman, etc.) and in different organizations (customers, project manager, construction firm, etc.).

¹ This research won the company’s annual Innovation Award in the Sharing Knowledge category.
The projects analysis shows that a firm can manage project speed by choosing a planned speed profile at the preparation stage of the project, and by driving an effective profile speed, which may differ from the planned one. The planned speed profile is chosen according to the strategy of the firm concerning the speed management. The effective profile is driven according to the terms of the contract, to the relationship between the customer and to the contractor and/or the importance of the time-to-delivery factor for them. We conclude by discussing the relevance of the NPD speeding up model in the case of EPC projects.

**Time-to-market reduction in NPD projects**

Time-to-market reduction is a competitive advantage for NPD projects. Speeding up NPD projects can increase profit margins by reducing the cost and/or increasing the earnings. Time plays a role in these two ways of generating profit: reducing delay can reduce the cost by the reduction of the financial immobilisation (Rosenau [12]), and can also, based on an economic analysis of first mover advantage (Lambkin [9]), create value in markets where obsolescence is central.

Thus, concurrent engineering (Clark and Wheelwright [6]) is a project management method that reduces project delay particularly by using cross-functional teams early in the NPD process and by planning parallel activities on the same project (for example, marketing and engineering work). Midler [X] showed that more than overlapping the project phases, delay reduction lies in the management of the relation between them. He represents a project by two curves: a learning one representing increase in knowledge about the project and a decision-making one representing a reduction in the possibilities of action on the project. The first is a process (shown as a dashed line below), where uncertainty about the project characteristics and its feasibility are gradually reduced; the second is a process of action (solid line), where the degree of freedom is steadily reduced as the irreversibility of decisions rises. Managing a project involves trying to resolve this dilemma: at the beginning of the project almost everything can be done but almost nothing is known; at the end, everything is known but almost no possible choices remain.

### Table 1 Main characteristics of the studied projects

<table>
<thead>
<tr>
<th>Project type</th>
<th>Duration</th>
<th>Place</th>
<th>Object of the contract - Type of contract*</th>
<th>Amount of contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction of a railroad tunnel and bridge</td>
<td>26 months</td>
<td>England</td>
<td>Construction work Cost + fee contract</td>
<td>£ 100 million</td>
</tr>
<tr>
<td></td>
<td>22 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of two office buildings</td>
<td>16 months</td>
<td>France</td>
<td>Construction work Fixed price</td>
<td>30 million</td>
</tr>
<tr>
<td>Construction of civil engineering work on a highway</td>
<td>24 months</td>
<td>France</td>
<td>Construction work Unit price contract</td>
<td>10 million</td>
</tr>
<tr>
<td>Construction of four tunnels for extending a subway line</td>
<td>46 months</td>
<td>Hong Kong</td>
<td>Design &amp; Build Fixed price</td>
<td>87 million</td>
</tr>
<tr>
<td>Construction of a suspension bridge</td>
<td>24 months</td>
<td>Greece</td>
<td>Fixed price Build Operate and Transfer</td>
<td>585 million</td>
</tr>
<tr>
<td></td>
<td>design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>60 months work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction of an underwater tunnel</td>
<td>60 months</td>
<td>Northern Europe</td>
<td>Construction work</td>
<td>2 billion</td>
</tr>
</tbody>
</table>
One might think that in order to reduce the delay of the project decisions must be made as quickly as possible. But at the beginning of the project, understanding is at too low a level and it serves no purpose to make hasty decisions. There is a risk of getting off on the wrong track, possibly resulting in costly and time-consuming modifications. Accelerating a project thus requires taking time at the beginning to explore and prepare project options as thoroughly as possible before deciding on them and putting them into practice. Then all the parameters need to be frozen in order to move towards almost automatic realization. Figure 2 shows that increasing the average overall speed (i.e., reducing the overall deadline) involves expanding the initial phase, synchronizing the decision phases and drastically cutting the realization phase.

This analysis points to three important issues:

- The model identifies two different processes, learning and implementation, that have to be managed from the speed point of view.
- Project management can be characterized by the speed of the three project phases: preparation, freezing, implementation.
- Efficient time-to-market reduction can be obtained through long and extensive anticipation before going through an automatic realisation.
From time-to-market to time-to-delivery

The EPC project is “a complex transaction involving a set of products, services and construction works designed specifically to complete a specific asset for a customer within a certain period of time: a building, a turnkey factory, a power plant, a weapons system, or the like” Cova [7].

These projects are above all characterized by:

- the specific, unique features of each product (a customized project mobilizing specific supplier resources)
- great complexity (numerous players from various institutions, a large outlay that occasionally requires complex credit arrangements, a long duration spread out over an extensive period of time, and so on)
- a contract, set in the early phases of the project between a client and a contractor, specifying the delay, the budget and the specifications.

Cost, specifications and delay are packaged in a contract between the contractor and the client, thus ensuring a definite trade-off between the project parameters (determined jointly by the customer and the contractor). Each modification of this trade-off necessitates many negotiations of the contract.

Thus, when beginning a project, the contractor anticipates a profit based on payments to be received (amount and schedule) and costs incurred. In order to realize this profit, he has to control his costs because he cannot easily modify the payments specified in the contract. Moreover, when EPC projects involve very large products (plant, bridge, etc.), the contractor cannot finance the project and thus depend on the payments. Realisation of the anticipated profit depends above all on effective cost control and on the realisation of the planned phase in order to receive the expected payment. The delay, speed and resources involved play an important role in controlling the costs. The time-to-delivery, therefore, is a key factor in EPC projects not only in terms of delay but also in terms of the progress of the project.

It also seems that the contractor in an EPC project has less room for action than the firm that develops a NPD project because he acts directly only on the costs and not on market value, which depends on client strategy. Indeed, one of the main differences between NPD and EPC projects is that the latter involves two actors, —the client and the contractor—both of whom play an important role in the main project decisions. We will discuss whether the time-to-delivery reduction and/or its achievement is a competitive factor for these two actors.

For whom the time-to-delivery reduction is a key factor in EPC projects?

We will study under which conditions it is interesting for the customer and for the contractor to reduce the time-to-delivery.

**Time-to-delivery for the customer**

The customer can consider the time-to-delivery in different ways.
Deadline and late penalties

Generally, the customer can fix a deadline with late penalties for the contractor if the deadline is not met. This situation is most frequently encountered in construction projects. It corresponds to a situation where the customer has no interest in seeing the work completed before the deadline set in the contract. He wants to have the project achieved exactly at the planned delay: not before and not after. This was the case with Hong Kong’s four tunnels extending the subway line.

Incentive clauses

Delay reduction can be a profit-raising factor for the customer. In that case, he will insert incentive clauses into the contract. This is especially the case in the BOT (Build Operate and Transfer) projects where it is worth beginning the operation as soon as possible. In this case, a trade-off between the increase in costs because of the acceleration and the increase in profit because of early operation of the equipment is made by one global firm, which undertakes the development and the market risks, as in NPD projects. The customer manages the time-to-delivery in a dynamic way by latching onto opportunities and finding additional funds in order to accelerate the work and have the project ready in advance of the planned delay.

This was the case with the office building project. The real estate developer wanted to take advantage of an opportunity for an extra year’s lease, since he had found tenants interested in early occupation. He thus came up with significant additional funds to accelerate the work. This was attainable despite the large number of actors belonging to different organizations and because of the partner relationship and mutual confidence built up over a succession of projects involving the same players. (This team, composed of a developer, engineering firms and construction firms, was on its third project together.)

Finishing early could also be of interest to the customer if this were to enable him to reduce his costs.

It was the case of the railway tunnel project, which was a cost-plus-fees (8%) contract with bonus and penalty clauses. This scheme functioned as follows. If a compensation event that led to revising project targets occurred, it was necessary to inform the customer of the event within one month, propose arrangements for handling it, calculate the impact on costs, and negotiate an agreement for sharing the adjustments between the customer and the contractor in accordance with the following rules: if the costs fell below the estimate, the contractor received the costs plus a bonus on the difference from the estimate; if the cost was greater than the estimate, the contractor received only costs up to the estimated amount. The customer paid the contractor the additional costs after deduction of a penalty for exceeding the estimate.

Soon after start-up, the tunnel was dug at a pace that was faster than estimated, gaining three months overall on the deadline initially set. This project illustrates the fact that the time-to-delivery reduction yields to project cost reduction, under these conditions:

- the importance of a partnership contract2 (with an open-book procedure), and the existence of a climate of mutual trust between the contractors and the customer, who was aware of the value of finishing the project early even if the infrastructure could not be put into operation right away
- a phase of detailed and in-depth worksite preparation
- the importance of a capacity for ongoing progress, which made it possible to make use of a learning strategy between the beginning and the end. This was made possible, in particular, by the location of the design on the worksite.

In conclusion, the customer can consider time as a resource, as in NPD projects.

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2 The two parts being governed by the same contract, including the same incentive clauses.
**Time-to-delivery for the contractor**

In the section below, we will study in particular the case of projects where the customer is not interested in reducing the delay. We can report to the section before, in case he is interested in.

One might imagine that an early completion relative to the initial schedule would enable the contractor to free up resources early. After balancing the gains with the cost of this acceleration, the contractor could be interested in a reduction of the time-to-delivery. But in EPC projects, the contract freezes the cost-delay-quality trade-off based on the project studies and worksite arrangements. This freezing is even more rigid when the contract includes time milestones that fix the main steps in the project. Any change in this planning requires negotiation with the customer, who is often reluctant to accept any modifications out of fear that accelerating the work could degrade the quality of the end product—unless, of course, the customer gains from the time-to-delivery reduction, which brings us back to the cases studied above.

So, it is unusual for the contractor to reduce the time-to-delivery. The contractor wants to avoid any urgent and costly changes in order to complete the project within the scheduled timeframe. This is particularly the case when the project encounters problems and does not take place according to the planned process. The contractor must analyse the reasons and take measures. In that case, the project might require modifications of design, methodology, organization and/or resources committed in order to meet the agreed-upon deadline. It is often possible to catch up to the initially scheduled speed with the additional allocation of resources (expanding the teams, working longer hours than scheduled) as well as by modifying the original jobsite arrangements, but this results in additional costs.

For instance, in the railroad bridge, the original organization of the works was to build sequentially from the east bank and then the west in order to reuse the tools and to exploit the learning acquired during the overall course. When it became clear that the bridge could not be completed within the deadline, not only were the initial design revised and the final deadline postponed, but it was also decided to shift to simultaneous construction from both banks resulting in doubling up on the tools and cutting the overall learning effect in half.

Such revisions inevitably necessitate negotiation and partnership relation with the customer.

For instance, in the underwater tunnel project the contractor quickly proposed changes in the design so as to significantly accelerate the pace of completing the tunnel segments. But the customer was not willing to accept the changes until it became apparent that, using the initial design, the tunnel would not become available within the set timeframe.

Therefore, the time-to-delivery reduction is not able to generate higher margins for contractors unless there is an initially flexible contract or a favourable climate for negotiation.

The role played by initial contract flexibility in customer negotiations is highlighted in the BOT bridge project. Here, the original commitment concerned a functional definition of the work, where “the only technical fixed point was the position of the pillars, due to geological tests that could not be redone.”

A favourable situation for negotiation is found above all in relationships involving ongoing partnerships between the customer and contractor, like in the case of the building project.

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3 Note that identifying contractual phases can play a very positive role by obliging the project team to complete steps that the latter might tend to neglect, with potentially harmful consequences.
In conclusion, the projects analysis shows that the aim of the contractor is to avoid costly changes. Time-to-delivery reduction for the contractor depends strongly on customer attitude, because it requires negotiation. Thus, contract flexibility and the relationship between the project actors are important. Without looking to reduce the time-to-delivery, the contractor in an EPC project must manage the time-to-delivery in order to:

- achieve it as fixed in the contract
- reap his profit by controlling his costs in case of unanticipated events that may delay the project or force him to modify the project organization in a costly way
- answer to the flexibility demand of the customer if he asks him to reduce the time-to-delivery.

In order to study the speed management in EPC projects, we propose the project speed profile concept, that we will define and apply to the projects studied.

**Managing speed in EPC projects**

We propose to break a project down into four basic phases: a preparation phase, an execution phase split between a transitory learning phase (Thomas [14]) and a permanent ongoing one and a back-up phase. Each of these phases has its own specific progression. We define the speed as the progression of the project achievement per unit of time, such as the number of $m$ excavated in a tunnel per week or the number of floors built per week.

We can represent the speed of the project by the curve of Figure 4, where the different phases with their specific progressions are distinguished. We will call this a speed profile or scheme.

![Figure 4 Speed profile](image)

Based on the six projects analysed, we will show that the contractor manages the project speed in two steps. First, during preparation of the project and anticipation of his profit, he plans to follow one planned speed profile. Then, as the project progresses, he drives the effective speed profile and reacts based on his previous expectations.

**Planned speed profiles**

During the bidding phase and contract negotiation, the contractor works on a planned speed profile in order to anticipate his costs. He can choose between at least the three following
planned speed profiles (see Table 3). These profiles reveal the resource deployment strategy of the contractor and the project organization he has anticipated.

<table>
<thead>
<tr>
<th></th>
<th><strong>Industrial profile</strong></th>
<th><strong>Learning profile</strong></th>
<th><strong>Back-up profile</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Graph" /></td>
<td><img src="image2" alt="Graph" /></td>
<td><img src="image3" alt="Graph" /></td>
<td></td>
</tr>
</tbody>
</table>

Table 3 Planned speed profiles

In the first profile, the *industrial* one, the preparation and the design phase are emphasized. Several processes are tested during the preparation and the learning phases, and executed during the permanent one. The *industrial* speed profile was planned in the underwater tunnel and the bridge projects. This profile is termed *industrial* because the approach to speed is similar to that of NPD projects for industrial products, where the firm invests in studies and in-depth exploration before locking in and freezing the choices in an effort to obtain a return on the upstream phases. In the case of EPC projects, this preparation phase is based on a very detailed phase of estimates, risk analysis and alternative organizations because of the numerous unpredictable events that may take place.

The *learning* profile is more common in construction projects: the preparation phase is not long (because generally the payments begin with the execution of the work). Optimisation of the processes is obtained after a long learning phase. Such was the profile of the Hong Kong tunnel.

In the *back-up* profile, the contractor expects a faster permanent phase than necessary in order to have a back-up that will absorb the unexpected problems without reorganizing the project. A margin, for example, was integrated into the planned profile of the railroad tunnel.

For each of these planned profiles, several effective profiles are possible.

*Effective speed profiles*

During the project, the project manager must react and has to drive the effective speed profile. Based on the six construction project analyzed, we will consider four effective speed profiles.

*Accelerated profile*

In this type of project, the project progression expected at the beginning of the permanent phase in the planned profile is reached before the anticipated time (see Figure 5). The learning phase has been accelerated because of anticipated actions such as very careful preparation or pleasant surprises (good quality of soil when excavating a tunnel, for example). If the contractor can negotiate an early completion of the project with the customer who is
interested in this reduction in delay, he can continue the project at this pace or go even faster because of the learning process. In that case, the effective permanent speed will also be higher than the planned one.

In addition to contractual aspects promoting speed and having partner relationship between the actors, these projects are characterized by a set of factors that work as a system for achieving this speeding up:

- selection of actors for the contractor and/or the customer team that had worked on similar projects
- product design emphasizing repetitions in the realization process (learning curve)
- preparation of the realization work and training
- anticipation of potential risks and preparation with the customer of measures to deal with them (rather than having to respond after they occur).

**Difficult start-up and controlled convergence**

This profile corresponds to a case where the project has encountered hitches in the breaking-in phase linked to technical innovations, surprises related to the on-site work (e.g., geological, environmental or social considerations) due to a lack of preparation or unpredictable events. The start-up difficulties do not, however, go beyond the initial breaking-in phase, and the project team rapidly negotiates a suitable answer to this crisis, with all the parties involved. Consequently, the difficulties do not spread to the permanent phase, which takes place at the planned speed (see Figure 6).
The BOT bridge project which took on board a large number of innovations.

**Difficult start-up and late convergence**

In this profile the difficulties of the learning phase spread to the permanent one and are responsible for the late beginning of this phase. In order to reach the planned delay, the permanent phase is accelerated with deleterious effects on the project cost because of reorganization and/or addition of resources (human or material).

The underwater tunnel project is an example of this profile.

Two factors are particularly relevant for these two latest profiles:

- the importance of confidence among the project partners, enabling the acceleration of learning throughout the project and confining breaking-in problems to the beginning of the project
- the mobilizing impact of the final deadline (“going flat-out”). As the degree of urgency increases, difficult compromises can be worked out more rapidly than when significant deadlines are distant.

**Permanent catch-up**

In this profile the project encounters many difficulties at the beginning, and the permanent phase is constantly delayed. It is as if the project has no preparation and no learning phase. It is based essentially on the responsiveness of the actors. The course of the project is a succession of events to which the actors respond in an atmosphere of urgency and crisis.

This profile is illustrated both by the four tunnels project in Asia and the bridge in the railroad project.
From speeding up NPD projects to managing speed in EPC projects

Is the concurrent engineering model relevant for EPC projects? While it is true that in EPC projects the overlapping that characterizes the concurrent model cannot be implemented and projects generally follow a stage gate model, this does not mean that concurrent engineering is totally irrelevant in these projects. Some of its guiding ideas, such as anticipation and time management, could be very fruitful in EPC projects and could offer new ways to think about these projects. We will discuss the relevance of the concurrent model for EPC projects through the main characteristics of these projects: the three Cs, the Content, the Context and the Contract. These characteristics are usually designated by professionals as obstacles to any transfer of industrial management methods to the construction field. We will discuss the three C specifics in the case of the six project studied.

- The content: The product is a prototype, a unique realisation, and there is not a volume-based production following development, as in auto-manufacturing, for example. But viewed in more detail, significant repetition can be identified in the components and the tasks, and learning can take place between the beginning and the end of the construction phase, resulting in time gain. Accordingly, adapting the product design in order to promote these repetitions can result in a speed-up of the project. In that case, the design phase can last longer and be considered an investment phase leading to significant learning and time gaining. The projects analysed illustrate these repetitions.

  The railroad tunnel reveals great repetition both in the excavating phase (about 2000 cycles) and in concreting (about 275 cycles).
  The BOT bridge is composed by four highly similar piles.

  These repetitions can also be fostered by the preparation of the realization and by the constitution and deployment of the work teams.

- The context: The product may have an impact on a large scale. Thus, many external actors, especially public ones, can interfere. The environment also can lead to unforeseeable events and substantial uncertainty (the local and regulatory context, geological and climatic contingencies, innovations in the structure and/or the construction process, etc).

  The railroad tunnel benefits from good surprises concerning the geological conditions and the excavating was faster than planned.
  On the other hand, the Hong Kong tunnels encountered hard geological conditions.
Emphasizing the importance of these contingencies means that anticipation and preparation must be combined with vigilance, responsiveness and ongoing learning. While it is unrealistic to think that all disturbances can be eliminated, the consequences they engender depend to a large extent on the managerial know-how developed to anticipate, detect and deal with them.

Even if the BOT bridge project occurs some problems in the beginning, it is the anticipation that permits to react rapidly and find other solutions. The accelerating of the work in the office building was not anticipated but the fact that actors had worked on several problems similar to the speeding up ones help them to find solutions.

It is probably because of a lack of anticipation and preparation of the explosive materials transport or the coordination with the design firm that the Hong Kong tunnels followed a permanent catch up profile.

We focus here on anticipation as an interactive and learning process rather than on the planning result.

- **The contract**: the trade-off between specifications, cost and delay is frozen at the beginning of the project can. It can often, be optimised in the course of the project but it involves then many actors and necessitates lengthy negotiations. The interactive anticipation process described above needs to be supported by flexible contract and partner relationship.

We studied projects such as the BOT bridge, the office building or the railroad tunnel, where the time-to-delivery was reduced. In these projects, the contractor and the client considered time-to-delivery as one of the project parameters to be managed, representing a mean of action and not solely a cost to control. The speed profiles (difficult start-up with controlled convergence for the bridge and accelerated profile for the latest) show that the way to accelerate the project as a whole does not necessarily lie in cutting down the phases proportionally but in emphasizing some phases over others and structuring their interconnection differently. Managing project speed thus comes down to answer the following questions: How much time should be devoted to the exploratory and the design phases? When should construction work, a costly and irreversible phase, begins? What should the relationship be between the design phase and the construction phase?

These examples show also that, in EPC projects, the flexibility of the contract and the implicit relationship that it permits play a huge role in creating a win-win situation necessary to manage time as a resource and not solely as a cost.

**Conclusion**

The management of time in the projects was studied primarily for NPD projects from a time-to-market reduction perspective. Our goal in this article was to promote greater understanding of project management by filling a gap concerning the management of time in EPC projects from a time-to-delivery perspective.

We have shown how the concurrent engineering model reduces time-to-market and speeds NPD projects. We discussed the importance of the time-to-delivery reduction for the customer and for the contractor. We showed that in EPC projects, customers can consider time as a resource and, in that case, they will encourage the contractor to reduce the project duration. But if they are not interested in early delivery, the contractor will generally go with the achievement of the delay fixed in the contract, reaping profit by controlling costs, particularly in the case of a required reorganization of the project. The reputation of the contractor
consists of his ability to respect the time-to-delivery and to satisfy the customer when he asks to speed up some phases.

Based on an analysis of six projects, we distinguish different phases in a project: preparation, learning, on-going and back-up, each having its own speed. These phases represent the global speed profile concept. The firm chooses a planned speed profile before the start of the project and then drives the effective speed profile according the planned one or in a different way in order to latch on the opportunities and react to surprises. Managing speed is choosing a planned profile corresponding to the speed strategy of the firm and then driving the course of the different phases and their connection. We characterized three types of contrasting planned profiles: the industrial, the empirical and the back-up one, and four speed effective profiles: the accelerating, the difficult start-up with controlled convergence and late one, and the permanent catch-up.

This depiction of the variety of possible speed profiles normally falls apart with general, oversimplified observations that treat speed as the simple result of other project dimensions. In contrast, our paper aims to show that, in EPC projects, time can be considered a resource and speed can be managed.

The goal in this article was to remain within the framework of a structural analysis. In further research, a subsequent causal analysis might consider the contractor’s ability to manage the planned and effective speed profiles. We could distinguish external aspects, such as relationships with the customer or the environment of the project, and internal ones, such as composition of the team, learning from past projects, product and process integration. Subsequent research, which is already under way, will answer the following questions:

- How can project supervisors be trained in order to handle these aspects?
- How can lessons on good speed management practices be shared?
- How promote the development of partnership practices which seems to be the cornerstone for effective speed management?
Acknowledgments

We thank the referees, Jonas Söderlund and Florence Charue-Duboc for their fruitful comments.
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