

# Approaches for the acceleration of the construction projects through the contractor in the rush projects

Mohamed Mostafa  
(College of engineering, Al Azhar University, Egypt)

**Abstract** – New fast track construction projects worth more than \$100 billion are being implemented in Makkah to improve services being rendered to millions of pilgrims who come for Hajj and Umrah. The new development projects in Makkah, including largest expansion of the Grand Mosque. The time factor has become increasingly as an outstanding requirement on this construction projects. In the present work, the question "acceleration of construction projects" is moved in the center. Consequently, innovative structures, procedures and techniques are required for a time-oriented project management; consistently and purposefully focus on the reduction of process time and not to shrink back from entirely new, unfamiliar processes. So recommendations for the efficient management of construction projects always need to be developed taking into account the specific objectives and boundary conditions. Approaches for the acceleration of the construction projects through the contractor were provided.

**Index Terms** – Construction industry, , fast track projects, construction time, project management, Reinforced Concrete Structures

## 1. INTRODUCTION

The construction time is an essential indicator of the project success, as both the construction cost and quality are significantly affected by the construction period. The construction time is usually given from the client. The construction time should be respected by the contractors or their subcontractors subsequently. The client has to manage those conditions as part of his contractual obligations that ensure the compliance of the construction time. New fast track construction projects worth more than \$100 billion are being implemented in MAKKA to improve services being rendered to millions of pilgrims who come for Hajj and Umrah. The new development projects in MAKKA, including largest expansion of the Grand Mosque. An important requirement for a fast track construction project is the stability in the project and the project environment.

In the present work, the question "acceleration of construction projects" is moved in the center. This is because the demand structures and needs in the real estate market are changing faster and faster. A short planning and execution time is

becoming increasingly clearer to an outstanding performance feature of construction projects. Expected and more often in the future a particularly short duration even become a decisive factor in the choice of the project team.

The acceleration is even from the construction perspective an interesting challenge, but it is neither an exclusively technical problem nor a matter of scheduling. The acceleration of construction processes is primarily an organizational and "group dynamics" challenge for the management. It must never be based on the setting, but everything as before, but a bit faster.

If the short duration of a project is based only on Pressure so suffers both the psyche of all interested parties and the quality of the work. Consequently, innovative structures, procedures and techniques are required for a time-oriented project management; consistently and purposefully focus on the reduction of process time and not to shrink back from entirely new, unfamiliar processes.

## 2. LITERATURE REVIEW

### 2.1 The time factor as a challenge for the construction project management

In recent years, the time factor has become increasingly as an outstanding requirement on a construction project. This is due to an attitude change towards the real estate and due to a tougher economic environment. A

• Mohamed Mostafa, Assistant Professor -Faculty of Engineering - Al Azhar University, Egypt. E-mail: mostfa36@hotmail.com

construction must more often not be only cheap and functional, but also can be offered to the tenant or buyer as soon as possible. Particularly in the commercial and industrial sector buildings are also becoming less as long-term investments and more and more considered as a commodity. If "time to market" is the decisive criterion, so long-term construction processes cannot be accepted. Industrial construction projects often have a compulsory given time limit - and often to be available only for a certain period of time.

### **Restrictions in the fast-track construction process**

Although the factor still so clearly moved in the foreground, but all other relevant objectives of the work must lie within a common or usual objectives scope. A high speed may not be acquired through poor quality or unduly high costs. The investment in a plant or in an investment property is only useful if the construction costs stay within a reasonable budget and the functionality is fully guaranteed.

### **Acceleration as an organizational problem**

Suitable tools and the required basic knowledge of the project management are a prerequisite, they bring alone but no acceleration of the construction process. Also the constructional engineering provides today many approaches for speeding up the construction work, but their effectiveness begins only at an advanced stage of the long construction process. If they are also not included in the early stages of the project in the planning, so they only develop a minimal effect. In contrast, when considered as whole project cycle time period from the decision of the implementation of a building till its commissioning, so often the early decisions and concepts of the customer, the authorization phases or the pre-engineering project will be the more time-consuming sections. With the acceleration of construction projects is then rather more an organizational than a technical problem. The determination of the basic organizational principles take places, together with many other dominant elements, even in the earliest stages of the project through the client.

### **2.1.1 Pragmatic acceleration and tactics innovative time management**

The problem of a very tight schedule is not new for the construction practices. It is confronted with a demand for a very fast implementation of projects and usually reacts with the following tactics.

### **2.1.2 "False shortening" of the operation duration**

When scheduling of construction projects is not infrequently assumed from luxuriantly designed schedules, a first reaction of the urging of the client to an acceleration is now to reduce the long-term operation durations. However, it is not a real time reduction, but only to the reduction of unnecessary time reserves.

### **2.1.3 Acceleration through consistent project management**

Since in many project planning, not the same attention comes up to time-related aspects as the cost or the functionality, a first acceleration can be achieved by the intensification of scheduling and monitoring. By increasing use of techniques of scheduling, an optimization is obtained. However, only negligence can be prevented and deadlines are met more easily. With these measures, neither innovative methods nor organizational changes are involved.

### **2.1.4 Project acceleration by streamlining and concentration**

In the context of known project processes, a change can take place in the priorities of the costs and the design of the deadlines. Under our clear prioritization of the period falls easier on all parties, the streamlining of all activities and deadline focus formation. Backed by a strong, competent project management, with emphasis forms the corresponding priorities in the formulation of guidelines, priorities set by current decisions and allocation of resources and a rigorous, advanced project controlling operates, a substantial acceleration can be achieved.

### **2.1.5 Minimum project duration by massive use of resources (crash projects)**

Already, the construction industry is in a position under exceptional conditions to cause massive acceleration. This is usually done by the extraordinary use of resources, and by the application of special authority

and an extraordinary motivation impact for all involved. However, this type of acceleration has its price. Other activities will be postponed or left undone, and the project team is under a non constant to be maintained pressure. This approach should therefore remain an exception.

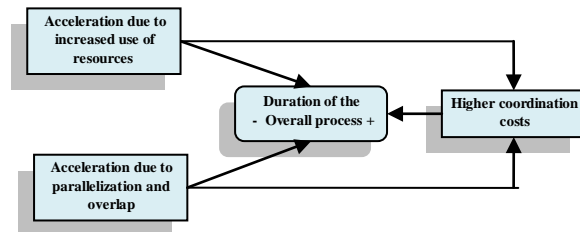


Fig. 1 duration of the process as a function of increased resource utilization and parallelization on the one hand and increasing coordination effort on the other hand

The parallelization of sub-processes offers as well as the higher simultaneous use of resources an enormous acceleration potential. But there is a significantly greater coordination and communication requirements, which in turn can cause loss of time.

## 2.2 Principles for the acceleration of construction projects

The duration of an overall process is determined by the processing time, the waiting time between the individual processing steps and the time sequence of individual sub-processes. The easiest way is to shorten the processing time. This can be done through the use of additional resources or technical tools, but predominantly through the use of know-how. The waiting times between processing cycles can be traced back to missing information or to a suboptimal organizational structure. To their reduction especially the interactions between the involved subsystems or processes are optimized. For each information flow and every interaction takes time and increases the risk of waiting times. The largest accelerating effect can be achieved by clever variations in the sequence of the individual sub-processes of an overall process. Corresponding sequence patterns can be aimed on the elimination of individual sub-processes, their overlapping or simultaneous processing, but also to the "redundant" problematic part machining processes.

## 3. APPROACHES FOR THE ACCELERATION THROUGH THE CONTRACTOR

The results from the planning phase of the client form the basis for the information through the management of the contractor. For this task of the design, the approach of the process orientation promises benefits. It says that the task is divided into individual processes and the rules for optimal cooperation are defined before the individual posts should be filled.

The first and most important task is therefore that of the formation of subprojects and sub-processes. By construction project as the sum of the less structured processes it is primarily to define parts of the project (bounded to physical parts of the construction), which can be processed to a great extent parallel and without extensive need for coordination.

Only on this basis processes can then be defined, where between control process for summarizing all project activities and execution process must be distinguished - usually as planning and implementation of individual parts of the project. Criterion for the classification of "future construction" must always be the minimization of interfaces. Only in this way massive and Simultaneous resources can be applied without increase of the coordination effort.

Effective coordination is a prerequisite for error free, risk-free as possible and especially fast track construction process. It can be supported through the high transparency in the project activities, demand for decentralized, autonomous coordination and especially through efficient information systems. This is only possible if the formalized communication is reduced to a minimum and an optimum environment is created for an intensive, independent informal communication.

This creates the precondition to maintain the organizational structure lean. Those responsible for the most important processes on the control the execution levels together with the representatives of the owner represent the highest project committee (the core team). At this level the most important project issues are discussed and coordinated, all other coordination are followed in smaller, thematically specialist teams or divided into groups. The actual planning and control of the project is carried out on the termination of the milestones of the individual processes. In this important task, in the fast track construction projects, at least

at a certain complexity, it is to entrust a specialist.

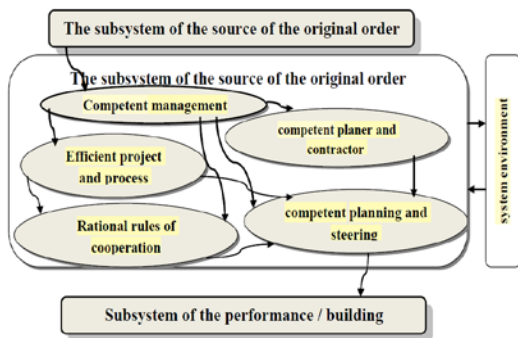


Fig. 2 interactions in the subsystem of the contractor

The subsystem of contractors is working on the following items, and tasks:

- 1) Collaboration between customer and management of the contractor (clarification of project contract and interface between the subsystems of the overall management),
- 2) Formation of a customized project- and process structure
- 3) Definition of regulations of the interaction in the subsystem of the contractor,
- 4) Definition of the organizational structure (organization chart and selection of planners / contractors) and
- 5) Planning and control of implementation.

In the "system design through the management" it thus concerns organizational tasks with the aim to trim the subsystem on an efficient, fast and risk-free as possible construction process. The shown approach begins now in the classic style with the choice of the parties, but with the structuring of the project. the optimal decomposition of the overall project into subprojects and processes is the most important prerequisite for the parallelization of as many sub-processes. Only in accordance of this structure, the most important regulations for cooperation are established. At the end of the organizational management , the most appropriate project partners should be sought for taking on specific tasks in predefined, regulatory environment.

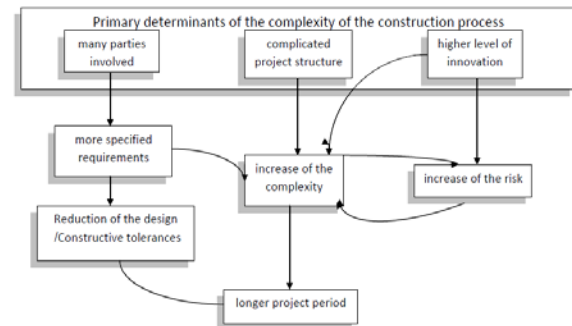


Fig.3 Activities for the design and control of the subsystem by the contractor management

Input for the design of the subsystem is the specifications of the customer. Due to this requirement the management defines the project structure and the important processes. The actual performance is ensured by the planning and control of this subsystem.

The above sequence is taken a process-oriented approach as basis, this means that the recognizing of the important sub-projects and processes as well as setting out the essential operations carried out before the allocation of posts and functions.

### 3.1 Clarification of project contract and the interface to the client

The management of the contractor is the first recipient of the specifications. The team leader will initiate the measures as a responsible for all other activities and the project results to implement and run the project subsequently. He stands at the beginning of the obligation to check critically the specifications to evaluate the risks and, if necessary, alert the client to optimize opportunities. For this analysis, and assessment of the task *Lomnitz* [12] has compiled a comprehensive checklist. From the perspective of the fast track project is particularly important that the project task is sufficiently clearly defined that there are no preventing or unnecessary restrictions to be made, and that the goals are realistic regarding costs and time. In particular, the task must not have any unexplained contradictions and in the interests of overall acceleration not contain unnecessary requirements regarding interim results or performance. At this point, the recommendation to the responsible general manager may not be missing, reject the project responsibility under unacceptable conditions. Discrepancies in the task (or in the technical specifications), which in the "normal" projects, still should be removed,

can cause frustrating failure in the fast track construction projects.

A particularly important precondition for the fast track construction projects is the smooth functioning of the communication between the client and contractors. If it does not become a bottleneck in the project, it is to be clarified regarding to technical criteria.

### **3.2 Acceleration as arranged or commissioned measure**

#### **3.3.1 Acceleration by changing the construction work**

The client decides - on their own initiative or on the basis of proposals of the contractor - for another procedure set out in the project, because he thinks thereby save time. The other procedure set out in the project may be composed of other types of construction or other materials. It may be cost neutral or expensive. Cheaper procedure set out in the project should be rare in this phase of construction for discussion, because is more likely that such variants eg. been presented and evaluated already in the tender phase as alternative tenders.

Changes of the types of construction and materials are typical of considerations to accelerate the turnkey construction. However, the risk of rash action is particularly great right here. Changes to design details that did not result considered effects in particular other trades, are counterproductive.

Complicating can affect that the client's decision is to accelerate and thus calculating the remuneration takes place only at a late stage of the contract.

It will be prevailing opinion that the client is entitled to change the construction plan to suit his convenience every time, even if the change of the construction plan by himself is only on grounds of the acceleration and thereby replace other possibly disputatious construction arrangement of the construction time.

The client, however, should think very carefully and get consultation whether such a step really brings the desired acceleration. Practice shows that often just the opposite is the case.

#### **3.3.2 Acceleration by changes in the construction process**

As previously discussed the example of the change in construction performance, the client decides for another sequence of the construction process. This may relate to one

trade, but also for several trades and thus several contractors at the same time.

Once the knowledge has matured, that a change in the construction process of the deadlines may be beneficial or for the acceleration is desirable, the question arises whether this can be arranged or with the contractor (optionally also with several) must be negotiated.

The author is - regardless of legal discussions on this topic - considers that such an acceleration of changes in the construction process reasonably always with the agreement of an acceleration premium should be connected. This is the only way that the client can be sure that the contractor supports the chosen solution.

In construction with execution from a single source (rather in the road and building construction), this procedure is relatively simple. Consistently problematic are changes in the construction process, when several contractors are affected. The factual clarification of the relationships and negotiations for commissioning can be time consuming. This often leads to the fact that the construction progress for acceleration of the planned measure runs away.

Last but not least, a bottleneck is that the planners must also be actively involved. At this construction project pre-planning is already so great that without interfering in the design of planning the execution sequence can be changed?

#### **3.3.3 Acceleration due to additional personnel costs**

This is probably the most commonly arranged or commissioned measure for acceleration. The idea is that any deliverables works needs a calculated man-hours which must be provided with a defined personnel capacity only in an resulting period. By changing the personnel capacity or the per working day to be rendered working hours, the execution time reduces. So far so good.

An increase in the number of personnel is in many cases not possible (Where To Get Them?) Nor meaningful (Shall which trample on the feet?). The same applies to the introduction of a multi-shift operation (suitability for approval? Where can you get the staff?). It remains the way of an extension of the daily or weekly working hours. Thus the calculated working hours (unchanged in total) processed in a shorter period of time in a first approximation.

In the second approximation overtime should be done, which must be compensated at a premium. About the level of these surcharges is a most quickly reached agreement. Therefore, the method "acceleration by overtime" shows a high amount of popularity with pressurized clients, but also for the contractors themselves. Evidence of these measures, the number of hours is relatively simple. The personal is available and usually willing to work overtime.

Largely unexplained is for the construction of which productivity losses is expected in massive overtime commitment.

Very frequently it is also noted that contractors already drive operating overtime to compensate for under calculated hourly expenditure values or self-inflicted disturbances of the construction process in time. Under these boundary conditions is then for any exceeding overtime use - even if he had been paid by the client - hardly any space when the frame of legality (Working Hours Act) should not be left.

### 3.3.4 Acceleration by the additional equipments

The case is relatively simple: The client comes to the conclusion that the reduction of the construction time is through strengthen of using of equipments or long period of time of using of equipments (including scaffolding, formwork and other auxiliary structures) or at least secured.

The increased or long period of time of using of equipments is not absolutely always considered as the contractors benefit alone, who provides the equipment. Frequent example is the long period of time of using of scaffolding or of crane in building construction, which is a benefit of several contractors and helps to minimize any interference.

An actual - measurable in days - acceleration effect is almost never proved. The work contractual success of the acceleration measure is that it was carried out as agreed. If despite the new measures it does not come to the desired acceleration effect or a compliance with the contract date, the client shall be in default not to pay the measure.

## 4. CONCLUSION & RECOMMENDATIONS

This study was commenced with the aim of developing new approaches for increasing efficiency in building through the "re-engineering of steering processes". The basic

idea was undoubtedly the right consideration that the efficiency of a system is significantly through its steering, thus determined from the project management. Solutions to this reengineering as redesigning of processing systems according to process-oriented design approaches have been hoped through the adaptation of suitable elements and practices from other industries. From the detailed analysis and comparative analysis, effectively and generally valid steering recommendations for the construction industry should be derived. This study moves in the interplay between the opposing attitudes, a) through standardization of construction processes to achieve greater efficiency in the construction or b) in view of the fact that just in building many problems are individually, that purposeful problem-adequate project design is considered as a particularly efficient solution. It leads to the conviction that standardization can indeed result in the large amount of "conventional" building project to optimize that so but never the entire spectrum of construction will be covered. Exactly in the targeted response to very specific requirements, special achievements and challenges will continue in the future.

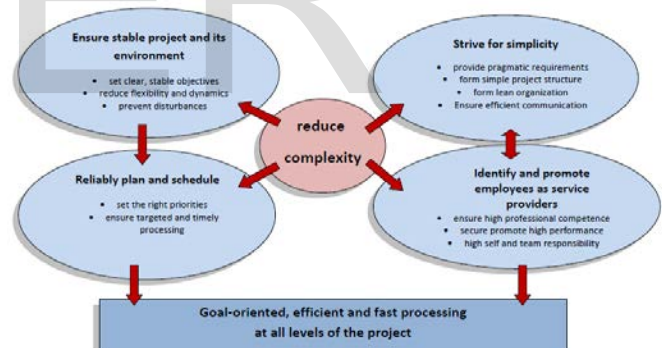


Fig.4 Approaches for the acceleration of projects

A further study on the acceleration is also another reason of importance: The acceleration demands ever after massive simplification of all processes and after a rigorous reduction of all activities on the essentials. Only then an acceleration is possible, and that is why it also acts very boosting productivity. This approach can also continue. When acceleration leads to increased productivity, so can be placed with the detour of acceleration by simplifying also the foundation for new gains in productivity. In other words: An indispensable element for the acceleration is the deleting of non-mandatory activities and dependencies. However, if they are not

necessary for the fast project, then they can not be eliminated at all?

But questioned from the construction industry are less abstract concepts, but the development of simple guidelines. The practice is based, even at the risk, a complex situation not to meet, more likely simple recipes. But precisely this present investigation doesn't seem to exist. Rather, it seeks rather, different possible boundary elements and varieties of acceleration to be taken into consideration. Demonstrating a variety of simplicity was preferred here. This brings naturally the disadvantage that it is precisely a lack of simple and concise recommendations.

To clear substantiated, proven findings and to simple, generalized principles for acceleration to be reached, is the variety that has been considered in this work, to be cleared consciously and strictly.

Only starting from simplistic assumptions about the boundary conditions and reference to clear, one-dimensional objectives can derive simple statements. Would merely simple, conventional projects investigated so in this way, it might be possible to prove quantitatively effects from individual measures or boundary conditions. An additional, practical approach this issue could therefore begin the discussion of differentiated "acceleration variants" of simple projects.

## ACKNOWLEDGMENT

First of all I would like to express my great thanks to God Almighty for helping me to finish this research, I'm also grateful to my family, all engineers and engineering companies who gave me their hands to help, for granting and supporting me by the data that I need to complete the research.

## REFERENCES

- [1] Bullinger, Organisationsformen  
Bullinger, Warnecke (Hrsg.), Neue Organisationsformen im Unternehmen, Springer-Verlag Berlin Heidelberg New York, 1996
- [2] Dean, Management  
Edwin B. Dean, Management from the Perspective of Competitive Advantage, Online in Internet: <http://akao.larc.nasa.gov/dlc/mat.html>. Stand from 30.6.1997, Abruf am 10.12.1999
- [3] Evensmo/Karlsen (2008)  
Evensmo, Jan ; Karlsen, Jan: Looking for the Source - Where Do Crash Costs Come From?
- [4] In: Cost Engineering. The AACE International Journal of Cost Estimation, Cost/Schedule Control and Project Management. Morgantown : The Association for the Advancement of Cost Engineering International (2008), Heft 7, S. 20 -23
- [5] European Construction Institute (ECI), Total Productivity Management volume 1: On-Site Productivity, European Construction Institute, 1994
- [6] Effi Bau, Baubewilligungsverfahren
- [7] Walter Ott, Rodolfo Keller, Verena Steiner, Kostensenkungen bei Planungs- Projektierungs- und Baubewilligungsverfahren, Herausgeber: Bundesamt für Berufsbildung und Technologie, Bern, 1998
- [8] Hager, Beschleunigungsmassnahmen Bauvorhaben  
Dipl.-Ing. Henning Hager, Untersuchung von Einflussgrößen und Kostenänderungen bei Beschleunigungsmassnahmen von Bauvorhaben, VDI Fortschrittsberichte Reihe 4: Bauingenieurwesen, Nr. 106, VDI-Verlag GmbH, Düsseldorf, 1991
- [9] Hänggi, Risikomanagement  
Roman Hänggi, Risikomanagement und Simultaneous Engineering, Dissertation Nr. 1782, St. Gallen, 1996
- [10] Hofstetter, Faktor Mensch im Projektmanagement  
Helmut Hofstetter, Der Faktor Mensch im Projektmanagement, in Schelle ... (Hrsg.), Projekte erfolgreich managen, Verlag TÜV Rheinland, 1994
- [11] Lomnitz, Projektvereinbarungsprozess  
Gero Lomnitz, Der Projektvereinbarungsprozess von der Projektidee zum klaren Projektauftrag: Sage mir, wie ein Projekt beginnt, und ich sage Dir, wie es endet, in Schelle ... (Hrsg.), Projekte erfolgreich managen, Verlag TÜV Rheinland, 1994
- [12] Malik, Management  
Fredmund Malik, Strategie des Management komplexer Systeme, Verlag Paul Haupt, Bern und Stuttgart, 1986
- [13] Ott, Interessenkonflikte und Selbstorganisation  
Hans Jürgen Ott, Interessenkonflikte und Selbstorganisation - eine neue Rolle für die Unternehmensplanung aus der Sicht der Chaosforschung, in „Zeitschrift Führung und Organisation" (ZFO) 2/97
- [14] Schelle..., Projekte managen  
Schelle, Reschke, Schnopp, Schub (Hrsg.), Projekte erfolgreich managen, Verlag TÜV Rheinland, Köln, 1994
- [15] Lieb, Forcierung und Verzögerung von Bauvorhaben  
Rupert H.G. Lieb, Wirtschaftliche Aspekte und Konsequenzen der Forcierung oder Verzögerung von Bauvorhaben, vdf Hochschulverlag AG an der ETH Zürich, 1997