High Tech Projects – Chances by Shifting Paradigm

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Roman Brylka
RomanBrylka Executive Consulting GmbH, Gebeckstraße 7, D-82515 Wolfratshausen, Germany
roman.brylka@romanbrylka.de

ABSTRACT: The following article is a report based on experiences from the management of high tech projects and furthermore, discusses the thesis - Chances by Shifting Paradigm - in the context of current large-scale international high tech projects, from the first application of the Transrapid in China to the construction of the first European Pressurized Water Reactor in Finland. As such, potential approaches and deductions will be considered in different respects for corporations and medium-sized businesses.

1 INTRODUCTION

Around the world, companies see themselves as confronted with increased pressure in terms of complying with deadlines, quality, and costs both on national as well as international markets. Based on experience, this particularly applies to high tech projects.
By means of a differentiated paradigm shift, in the context of lean management and the embedding of external know-how and do-how, the chance to take on these challenges and exploit them in a profitable manner arises with respect to a global market. The chance lies in diligently minimizing the risks and weaknesses specific to an enterprise while expanding one's own strengths over the long term.
The following article is a report based on experience from the management of high tech projects and furthermore, discusses the thesis - Chances by Shifting Paradigm - in the context of current, large-scale international high tech projects.
In the process, the focus of this composition lies on the project and engineering management while orienting itself with the special requirements of lean management respectively lean production and lean construction as keys for a high degree of effectiveness and efficiency.
As such, potential approaches and deductions will be considered in different respects for corporations and medium-sized businesses (MB) as well as smaller medium-sized business (SMB).


Figure 1. Transrapid Shanghai, all rights TRI.

2 DEFINITIONS

In order to provide for a joint fundamental understanding for this composition, the basic definition of globalization, shifting paradigm, and lean management will follow.

2.1 Globalization

Technical advancement, in particular with respect to communication and transport technology as well as political decisions to liberalize global commerce are regarded as the essential causes of globalization. Theodore Levitt, a German emigrant and former professor at the Harvard Business School coined the term globalization in 1983 in his article "The Globalization of Markets", which appeared in the Harvard Business Review [01].

2.2 Shifting Paradigm

Shifting paradigm constitutes an often radical shift in the perspective of a scientific field, a theme - of its paradigm. This provides the foundation for further development [02]

2.3 Lean Management

Lean management signifies an increase of efficiency and effectiveness in order to provide the customer with the services he/she really wants and to do so at the right time, in the agreed quality and at certain prices. Lean management is decisively characterized by streamlined corporate management and flat hierarchies. The primary concern of this model lies, with respect to customer satisfaction, in concentrating on effectiveness and efficiency.

For a company, this means producing a predefined result in a minimum amount of time as well as with a minimum of resources and investments or, on the other hand, to produce a maximum result with the present commitment of resources. Alternating between the pursuit of these objectives in the course of a continual improvement process represents the task at hand [03].

3 THE CHALLENGE

Particularly with respect to high tech projects and especially in the project business, experience shows that the pressure to succeed increases, which burdens both the project and engineering management. This is most often triggered by the multiplicity of ground rules as well as internal and external interfaces.

As a result, the management sees itself, across all hierarchies and corporate forms, confronted with challenges of increasing difficulty and in some cases, with new ones.

The decisive components of the project baseline, deadlines, quality, and costs show themselves to be influenced by the following parameters:

Deadlines
- Extreme reduction in project times,
- Dynamic interaction of flows and
- Considerable acceleration in decision-making processes.

Quality
- Highly complex,,
- interdisciplinary tasks,
- multicultural participants,
- concerns defined by external and internal partial interests
  and
- resources limited based on the organization.

Costs
- Increased readiness to respond to demands of all those involved as well as
- Multiplicity of changes accompanying the project

The global press depicts the acute affects of the factors presented on high tech projects:

2003-12-03 | *Manager Magazin* [04]
Toll Collect – *Die dritte Verzögerung* [The third delay]

2006-06-14 | *Wirtschaftswoche* [05]
A380 – *Airbus steht vor Schadenersatzforderung* [Airbus faced with indemnification claim]

2006-10-27 | *Welt* [06]
Galileo – *Satellitensystem droht deutliche Verzögerung* [Satellite system threatened by considerable delay]

2007-10-11 | *Spiegel* [07]
Dreamliner – *Quantas will Entschädigung von Boeing fordern* [Quantas seeks indemnification from Boeing]

2008-03-17 | *Focus* [08]
Siemens – *Großprojekte fressen den Gewinn* [Large projects consume profits]

2008-08-29 | *Süddeutsche* [09]
Areva – *stellt Milliarden für Atomreaktor EPR zurück* [Areva - defers billions for EPR nuclear reactor]

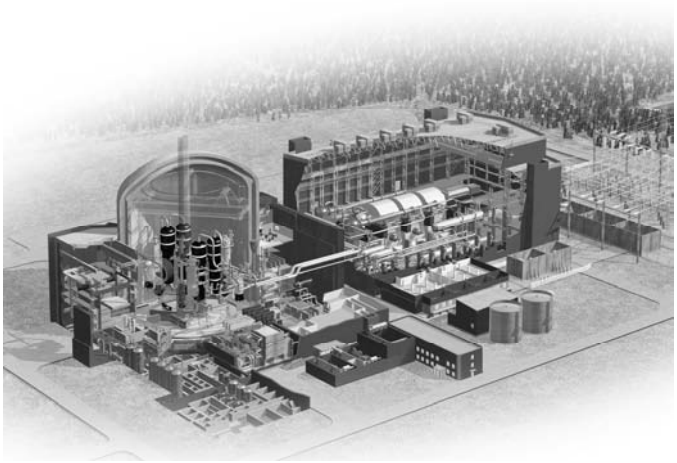

Figure 2. EPR Finland, all rights TVO.

4 THE CHANCE

Companies, which openly approach the challenges of the globalized market, stand to gain considerable chances for management and production in return.
These chances lie above all in the development of implementation of structured systems and processes, which can be scaled in terms of demand, by means of also exploiting global resources.
As such, innovative companies assure their existence on the market over the long term and realize continual increases in project results.

5 THE KEY

The key for taking advantage of and implementing the chances offered, in the context of the globalized market and the economically attractive implementation of high tech projects, lies in the fundamental concept of lean management.

Graf-Götz and Glast [10] define the following 10 points as decisive for streamlining in the sense of the lean approach:

- Alignment of all activities with the customer
- Concentration on own strengths
- Optimization of business processes
- Constant improvement of quality
- Internal customer orientation as a guiding principle
- Individual responsibility, empowerment, and team work
- Decentralized, customer-oriented structures
- Management is service rendered to the employee
- Open information and feedback processes
- Transformation of position and culture within the company

The foundations of lean management are thereby reflected, in addition to transformation of values and culture, in the concentration on the value creation process and customer satisfaction for the continual increase of effectiveness and efficiency.

6 THE THREE APPROACHES

Based on the experiences of current high tech projects and the fundamental concepts of lean management, three attractive approaches can be derived for the project and engineering management in order to reach project targets and secure them over the long term.

6.1 Expanded Focus

The analysis of current projects shows that the diligence shown in taking the entire value creation chain of a project into consideration is decisively responsible for the financial success of a project.
This means expanding the focus of the project and engineering management beyond the standard project phases, project setup, processing of tasks, and project completion to include the pre and post project phases essential to the project success.

Despite the subordination of project phases, project setup, and project completion in terms of time given that, for the most part, they take place at the same time as the inherent processing of tasks, it is recommended that a very high degree of attention is given to these phases.

For such project phases decisively form the boundary conditions, structures, and standard processes for the value-creating performance of tasks and also decisively serve to enhance additional economic potentials.

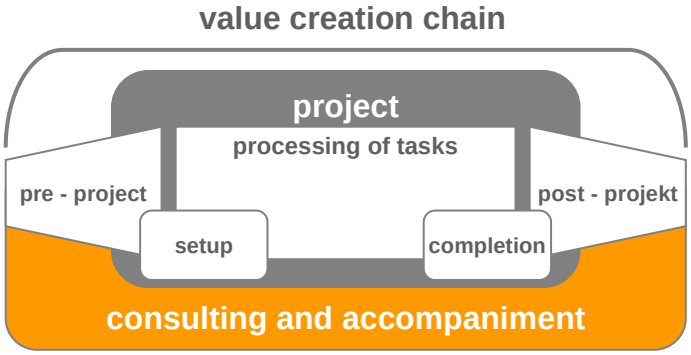

Figure 3. Expanded management focus.

The pre and post project phases also show themselves to be of a crucial and cross-project nature.

As such, the task at hand involves creating ground rules for the pending project, which have been optimized to the furthest possible extent. The goal-oriented management of the project portfolio as well as diligent negotiation of all project conditions and ground rules take centre stage in this case.
The findings from projects completed in the past as results from the post project phases allow the management to acquire new projects, to define the corresponding targets to the best possible extent, and to select optimal strategies and tactics for this.
The conscious expansion and decided consideration and observation of the standard project phases thereby represent an underlying step towards the diligent observation of the entire value creation chain.

Based on our experiences, the consideration of this approach leads to a largely balanced project baseline and consequently, to a positive relationship to the customer.

6.2 Scalable Systems

The financial success of a project and the long-term success of a company is directly linked to the satisfaction of the customers.
Along with such soft facts such as engagement, creativity, and socially competent conduct, hard facts such as reaching targets in terms of deadlines, quantity/quality, and costs define the satisfaction of the customers.
According to established project management systems, the project management is essentially divided into the following nine areas of activity, which are provided below in alphabetical order [11],

- Communication management,
- Content and scope management
- Cost management,
- Integration management,
- Procurement management,
- Quality management,
- Resource management,
- Risk management,
- Time management, and

which are to be subjected a continual improvement process.
In order to focus on customer satisfaction and as such, on the long-term success of a company, relying on a scalable management system is recommended. For above all project organizations and processes, which dynamically adapt to the project requirements, are efficient and effective.
A differentiated consideration of the management operating areas listed above lies in the first step towards the development, implementation, and project-specific adaptation of a scalable management system.
Grouping into level 1, level 2, and flanking management activities has produced optimal results in this respect.

Management operating areas, which decisively define specifications for others operating areas, are suitable for classification as level 1. This includes by order of priority:

- Communication management
- Integration management
- Quality management
- Risk management

PM activities, which in addition to the prioritized steering components, comprise a decisive controlling component and therefore, direct and indirect indictors of customer satisfaction are recommended as level 2 PM operating areas.

- Content and scope management
- Cost management
- Procurement management
- Resource management
- Time management

In order to assure the project-specific targets, the approach of diversification and flanking arises for scaling.

The supplementation of the level 1 management activities with stand-alone interface management is available as initial diversification particularly for high tech projects. For complex tasks, efficient interface management represents an essential pillar of project success. [12]

Above all, the level 1 and level 2 flanking management activities presented below serve diversification.

- Change management
- Claims management
- Contract management

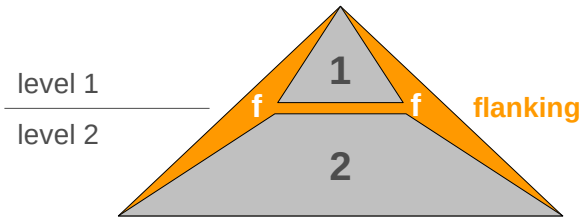

Figure 4. Grouped management activities.

In order to reach these project targets and to secure them over the long term, it is necessary to adapt the project organization and processes to the requirements dynamically and in line with demand - Scalable systems represent a highly proficient method in this respect.

6.3 Own strengths and external services

If the entire value creation chain is considered and if a scalable demand-oriented management system is in place, then the project and engineering management in the third approach concentrates on the own strengths, the management.

For the company, this means concentrating on its own specific core competence and thereby decisively enhancing the project phase of processing tasks.
This course of action provides above all the project and engineering management with the possibility of effectively and efficiently achieving project success with an across-the-board lean organization supplemented with demand-based external consulting and accompaniment.

This approach focuses on exploiting the resources provided by a globalized market.
Professional third-party consulting supports the inherent processing of tasks based on the situation and the product-specific integration management.

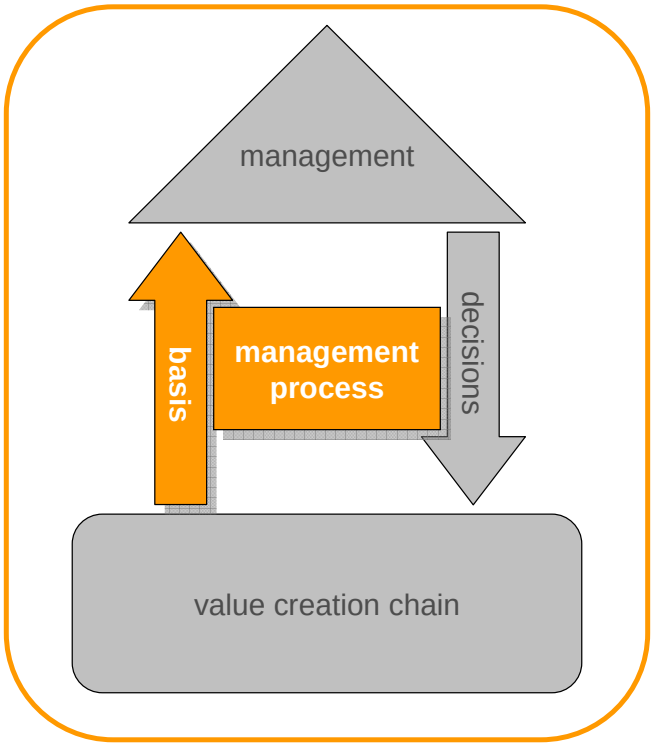

Figure 5. Management cycle and fields for accompaniment.

It supplements the company's know-how thereby enhancing the profitability.

7 THE REFERENCE

In November of 1999, the Chinese Ministry of Science and Technology decided in favor of a suitable Transrapid track in the People's Republic of China and investigated the feasibility in terms of its technical and economic parameters.
Thus, the city of Shanghai decided in June of 2000 to have a study on the feasibility of a Transrapid track of 30 kilometers in length, from the new airport, Pudong International, to downtown Shanghai.
Following a comprehensive technical and economic evaluation of all known superstructures from the German project Berlin - Hamburg, the Chinese decided on their part in favor considering the implementation of the planned project in Shanghai, the hybrid guideway.
After only two years of construction, the successful maiden voyage of the Transrapid (TR 08) took place on 31 December 2002 according to plan in Shanghai.
In order to see to this, the Chinese client, who carried out in full charge the planning and the construction of the track, commissioned German consulting and accompaniment.

Based on the stringent timeline and the technological challenges, the consulting and accompaniment was conducted in two stages.

Stage 1 Consulting and training of the Chinese engineers in Germany
Stage 2 Consulting and accompaniment of the Chinese partners on-site in Shanghai

During the first stage of the project, the task at hand concerned the smooth and prompt initiation of planning work and see to the production of the track. For this reason, Chinese engineers, shortly before the signing of the contract, were prepared for the pending project in a 10-week training session in Germany. The following core areas were trained in this process:

- The Transrapid's system-specific requirements of the guideway
- Hybrid guideway girders and their components
- Substructures
- Foundation soil and foundation variants

The aforementioned core topics were handled in the course of this training session from a planning standpoint on one hand and from a production standpoint on the other.
In order to prepare the detail design, 3D design was trained using the example of prototype girders in addition to the benchmarks, the methods for the static and dynamic calculation, and operating of software developed specifically for the design of the hybrid girders in a comprehensive manner.
The topic of production was divided into two decisive areas with respect to the manufacture of the hybrid girders:

- Layout of a production hall for hybrid girders
- Work preparation by means of constructing prototypes


Figure 6. Drafted layout of Shanghai production hall.

On the one hand, a layout of a product hall configured for the Shanghai project was drafted for the Chinese client as part of the training session and on the other hand, work preparation for the start of series production was conducted.

From March to September of 2001, a plant, approximately 1.8 km in length and approx. 300 m wide, was built in Shanghai for the production of the hybrid guideway. Due to the very short construction time imposed, the required production capacity had to be ensured by means of employing 32 formwork shells. Starting in February 2001 to December 2002, employees from the German companies maintained constant on-site presence in Shanghai in order to accompany the Chinese contractor. The focus of their consulting of the contractor primarily constituted, in addition to the management of the Detail Design and manufacture of the guideway. Aslo the coordination of those involved in the project, German and Chinese companies, with respect to the guideway concerns.

On 31 December 2002, the TR 08 successfully completed its maiden voyage according to plan with a maximum operating speed of 430 km/h.

The impressive construction time of approx. 18 months for the route according to plan could only be realized by means of the ongoing confidential and interactive collaboration between the Chinese companies involved and their German project partners for consulting and accompaniment [13].

8 THE SHIFTING PARADIGM

Based on that stated above, it follows that companies, this applies both to corporations as well as medium-sized businesses, which plan to maintain or enhance their project results in the globalized market and with respect to the requirements of complex projects, will be faced with a critical confrontation with the paradigm of the project and engineering management of comprehensively relying on internal management know-how and do-how.
Considered in general, it is necessary to move away from the reservation of the extensive competence field of management and to concentrate one's self on the core competence of the management in the context of the company's value creation, to secure customer satisfaction, and the company's know-how. By means of the demand-oriented deployment of external, partnered consultants, and accompanying parties in the project and engineering management,

situations critical to project success can be mastered in an effective and efficient manner.
hen considered in a differentiated respect, determined by the prevailing corporate organizations and structures, this signifies an approach for corporations and medium-sized businesses.

8.1 Approach for corporations and medium-sized companies

The case-specific rendering of services takes center stage with respect to consulting and assistive services oriented with corporations. This applies above all to service components oriented with consulting and controlling such as presentation and negotiation support as well as process and result rehearsal, review, and controlling. The decisive benefit here, which arises for a corporation's internal project and engineering management represents the independent, readily available embedding, dependant on the system and structure(s) in question, of highly-qualified resources for a defined period of time. Lean management is thereby in an ideal position for processing complex projects in a financially optimized manner while focusing on integration and production – Executive Support.

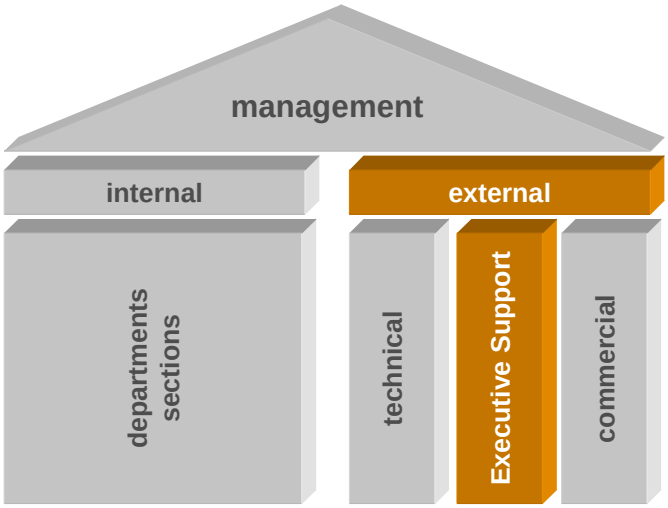

Figure 6. On demand executive support.

8.2 Approach for smaller medium-sized companies

In addition to the benefits of fall-specific, partnered consulting and accompaniment, the option of a ad-hoc know-how and do-how arises for smaller medium-sized companies. By means of embedding independent, external competence, the concentration of the internal management on rendering services and customer satisfaction, as well as in demanding project situations, is continually assured.

9 OUTLOOK

In inspecting the current market, it can be determined that companies, which critically evaluate their patterns thus far in the context of the globalized market and the increasing requirements of complex projects and put them to text, will end up ahead of their market competitors in the long run in terms of project success and expanding on their market position.

2008-08-18 | Xinhua [14]
Shanghai / Hangzhou – Maglev project to begin construction in 2010

China's decision to plan and construct an interregional Maglev route, Shanghai - Hangzhou, testifies to China's exceptional national vision and dawns a new era in long-distance rail transit.
The course of this exceptional high tech project will, in comparison to the construction of the world's first Transrapid application in Shanghai, show whether innovative approaches in terms of consulting and accompaniment aiming to ensure success, also be taken in this case.
A particular challenge for this project represents solving new or considerably different topics in addition to the route to be used, which is physically larger, and the more complex topics in existence, which as a result are of greater proportions. Tunnels, bridges, signal switches, safety and control technology etc. can be mentioned as examples. Likewise, the financial optimization of the product as well as its manufacture play a superordinated and challenging role.

Corporations and medium-sized companies have the considerable opportunity to profit over the long term by shifting paradigm.

High tech projects and their challenges make up the operative business. Current paradigms have been recognized and approaches have been identified. Corporations and medium-sized businesses have the chance to profit over the long term by shifting paradigm. Concentrate on your strengths and supplement your project work with external know-how!

References

[01] Levitt, Theodore: „The gobalization of makets“, Harvard Business Review, 1983.

[02] Kuhn, Thomas S.: „Die Struktur wissenschaftlicher Revolutionen“, Suhrkamp Verlag KG, 2002.

[03] Ohono, Taiichi: „Das Toyota Produktions-System“, Campus Verlag; 2005.

[04] www.manager-magazin.de: „LKW-Maut: Die dritte Verzögerung“, 03. Dezember 2003.

[05] www.wiwo.de: „Lieferverzögerung: Airbus steht vor Schadenersatzforderung“, 14. Juni 2006.

[06] www.welt.de: „Satellitensystem: Galileo droht deutliche Verzögerung“, 27. Oktober 2006.

[07] www.spiegel.de: „Dreamliner-Verzögerung: Quantas will Entschädigung von Boeing fordern“, 11. Oktober 2007.

[08] www.focus.de: „Siemens: Großprojekte fressen den Gewinn“, 17. März 2008.

[09] www.sueddeutsche.de: „AREVA stellt Milliarden für Atomreaktor EPR zurück“, 08. August 2008.

[10] Graf-Götz; Glatz: „Organisation gestalten“, Beltz-Verlag, 2001.

[11] PMBOK Guide: „Project Management Body of Knowledge Guide“, PMI, 2006.

[12] Brylka, Roman: „Schnittstellenmanagement – Die Herausforderung der Zukunft“, KonzeptBayern, 2007.

[13] Feix, Jürgen; Brylka, Roman: „The German Transrapid guideway – Conclusions on the guideway’s first use in Shanghai“, Maglev, 2004.

[14] www.xinhuanet.com: „Maglev project to begin construction in 2010“, 18. August 2008