PROJECT MANAGEMENT MODELS FOR LONG PRODUCT ROLLING MILLS[1]

Alberto Lainati[2]
Massimiliano Arena[3]

Abstract
In world's areas with a significant infrastructures development, it is required to install bar production plants in an extremely short time-frame and in an economic local environment with dynamic peculiarities. This results in a variety of services and scope of supply and in a keen awareness of project complexity and Customer's requirements. While the first issue determines the individual project scheme, ranging from complete turnkey plants to the simple supply of the core equipment and plant technologies, the second issue concerns the risk profile assessment and management by both Contractor and Customer. Some operational models are analyzed and compared, with a specific focus on the time/cost impact, on the risk/opportunities evaluation and on the organizational setup for Contractor and Customer. Mentions are done to the utilization of the PM@Siemens method during the entire project life-cycle.
Key words: Long rolling; Project management; Risk evaluation.

PADRÕES DE GERÊNCIA DE PROJETO PARA LAMINADORES DE LONGOS

Resumo
Nas regiões do mundo com desenvolvimento significativo de infra-estruturas, é necessário instalar plantas de produção de barras em um prazo muito curto e em um ambiente econômico com condições particulares e dinâmicas. Para isso, é preciso dispor de um leque completo de serviços e soluções de fornecimento, assim como manter uma percepção abrangente da complexidade do projeto e dos requisitos do Cliente. O primeiro assunto decide o esquema individual de projeto, que pode variar de planta completa "turnkey" ao simples fornecimento dos equipamentos e tecnologias principais, enquanto o segundo determina a análise e gerência do perfil de risco e sua gerência por ambos Fornecedor e Cliente. Alguns padrões operacionais são analizados e comparados, com atenção específica ao efeito prazo/custo, à avaliação de risco/oportunidade e ao setup organizativo de Fornecedor e Cliente. Menciona-se o uso do método PM@Siemens durante todo o ciclo de projeto.
Palavras-chave: Laminação de longos; Gerência de projeto; Avaliação de riscos.

[1] *Technical contribution to the 46th Rolling Seminar – Processes, Rolled and Coated Products, October, 27th-30th, 2009, Santos, SP, Brazil.*
[2] *Operation Director – Siemens Metals Long Rolling IT*
[3] *Project Manager – Siemens Metals Long Rolling IT*

INTRODUCTION

World Economic Scenario

Steel is universally recognized as a major driver of growth for the economy of a country. The astonishing trend of increase in steel production on a global basis during the last decade was originally pulled by the Chinese economy pulse and then vitalized by the industrial and trade development in other areas worldwide.
Present times (2009) see the world community burdened by a recessionary scenario, where financial instability and economic turmoil slashed steel production and plant investments, in comparison to the booming years of 2006-2008.
Still, over the recent months major investments in infrastructural facilities have been taking place in China and elsewhere, in the attempts by the governments to boost the economy.
A key role in these projects is played by long products, whose efficient manufacturing - now more than ever - calls for quality levels of production scheduling and operational flexibility.
Siemens Metals Long Rolling, a global leader in the engineering and building of hot rolling mill plants for long products, is contributing to this challenging run with the supply of both complete plants and revamp projects.

MATERIAL AND METHODS

The Hot Rolling Mill project: structure and internal management processes

A project for a complete Hot Rolling Mill consists of a core technological line that is the rolling mill (mechanical equipment and related media services, E&A, process know-how), complemented by the balance of plant (BoP), that is the other main not-proprietary technological package (i.e. Re-Heating Furnace, Water Treatment Plant, Workshops, etc) as well as the overall plant infrastructures and service equipment.
All the packages are technically integrated in a full turnkey plant developed, in most cases, on a green-field basis.
Without detailing the technological contents of the rolling mill, it must be anyhow highlighted that a specific feature for turnkey projects executed by Siemens is the adoption of consolidated solutions based on standardized/integrated core-packages.
The efficient incorporation of the available “Product Solutions” in a single plant project execution spins around a structured PLM (product life-cycle management) system interacting with an articulated Project Management system (PM@Siemens); these two main structural systems, part of the overall Order Management system ruling all the company’s tools and processes, are the backbone for a clustered utilization of the core lines, a must to combine the typically stringent project time requirements with the absolute production reliability and easiness of plant operations.
Figure 1 gives an outline of the Siemens’ systems and processes together with their interrelation around a Project.

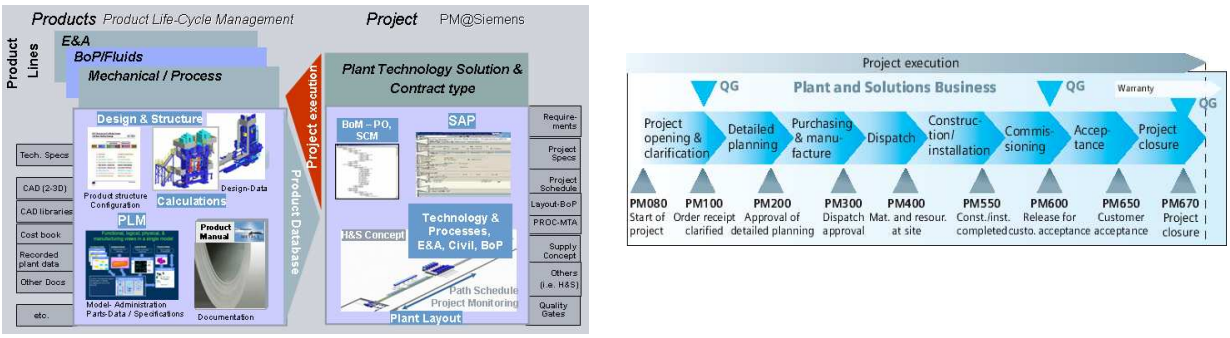


Figure 1: PLM and Project Management System (PM@Siemens).

This structured basis of management of the Products and of the Project Processes is not sufficient alone to grant the successful execution of a project contract, unless it is taken into consideration and tuned up with the peculiarities of each area project, the so-called Local Factors.

RESULTS

Local factors

The main factors related to the specific local business environment encroaching on the project life-cycle are:

- The Investors' profile variety
- The availability of consolidated and stable skills, technical and managerial
- The local policies and regulations
- The availability of "infrastructures" in the broad sense of the term

Variety of Investors: beside some major local institutional players (normally one for each country) established in the steel industry long ago and acting with business logics similar to those of the countries with an everlasting tradition in the field (namely EU and China), the steel market dynamics and the macroeconomic scenario have attracted in the business many private subjects active in diversified industrial sectors together with pure financial and trade enterprises. All these different types of Investors focus on the complexity of the project with a different level of awareness and with heterogeneous approaches in the own project management.

The main factors related to the business environment are:

- Fragmentation and inadequacy of local regulations and technical standards, not yet unified and fully tuned according to the pace and to the requirements of the industrial development
- Presence of pools of heavy bureaucracy for specific matters, with difficult decoding/interpretation/application both for the local investors and for the foreign companies, even those with established branches (i.e. working visa rules, building permits)
- Shortage of local infrastructures and services available to the plant construction sector: i.e. power distribution lines, substations, gas lines, roads to the new industrial areas, construction materials (cement, steel, trade components), service equipment (piling rigs, excavators, cranes, mobile equipment) and lack of a sufficient number of engineering/construction contractors with specific know-how, flooding of improvised new-comers contractors, manpower in general, etc, with consequent price escalation in all sectors accompanied by times drift and declining quality of the services

- Constantly unbalanced volumes and prices in the “verticalized” steel production chain from raw material to finished products (i.e. chronic shortage of billets to feed the rolling mills, uncontrolled price fluctuations, chronic importing dependency) creating an instability of the business plans

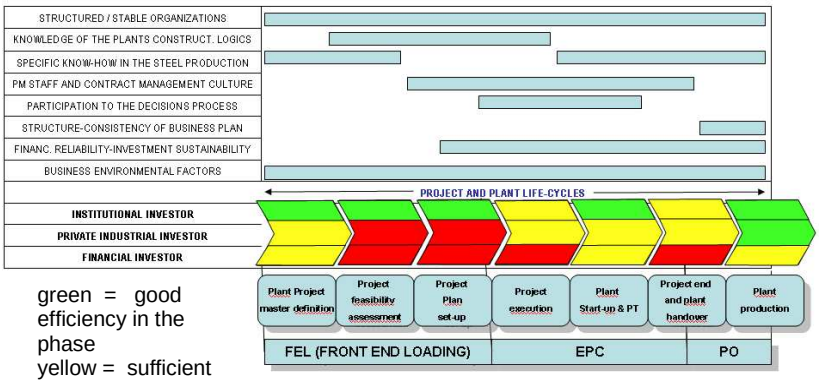
The matrix of the Investor’s and business environment features is assessed by categorizing the following key-parameters:

With reference to the value chain for a steel plant investment, whose phases are:

PLANT LIFE-CYCLE = Project life-cycle (FEL[1] + EPC) + Plant Operations (PO)

The below diagram evidences the impact of the various factors and the criticality for each of the sub-phases.

Parameters 1 = good/high 2 = sufficient/medium 3 = critical/low	Institutional Steel Investor	Private Industrial Investor	Financial Investor
Structured/stable organizations	1	2	3
Knowledge of the industrial plants construction logics	2	2	3
Specific know-how in the steel production core-competencies	1	3	3
Project management staff and contract management culture	1-2	2	2-3
Knowingly participation in the decisional process	1-2	2	2-3
Structure and consistency of the business plan	1	2	2-3
Financial reliability and investment sustainability	1	2-3	2-3
Utilization of external consultancy agencies	1	3	1-2
Limits in Local Regulations- technical Standards – bureaucracy	2	2-3	3
Shortage of supporting Infrastructures and Services	2-3	3	2-3
Unstable market of steel products	1	3	2-3



green = good efficiency in the phase
yellow = sufficient

Figure 2: FEL and Project Phases vs. customer profile (PM@Siemens)

Contract models: the classic and the new ways to execute a project

The models of contract applied for a construction project of a Rolling Mill Plant are typically of two types: the Lump Sum Turnkey and the Supply contract of core technological packages (Figure 3).

[1] FEL (Front End Loading) is the process of analysis, study, planning and design phase in which the scope of work relevant to the plant is developed; during FEL the detailed scope of the project is developed according to the business strategies.

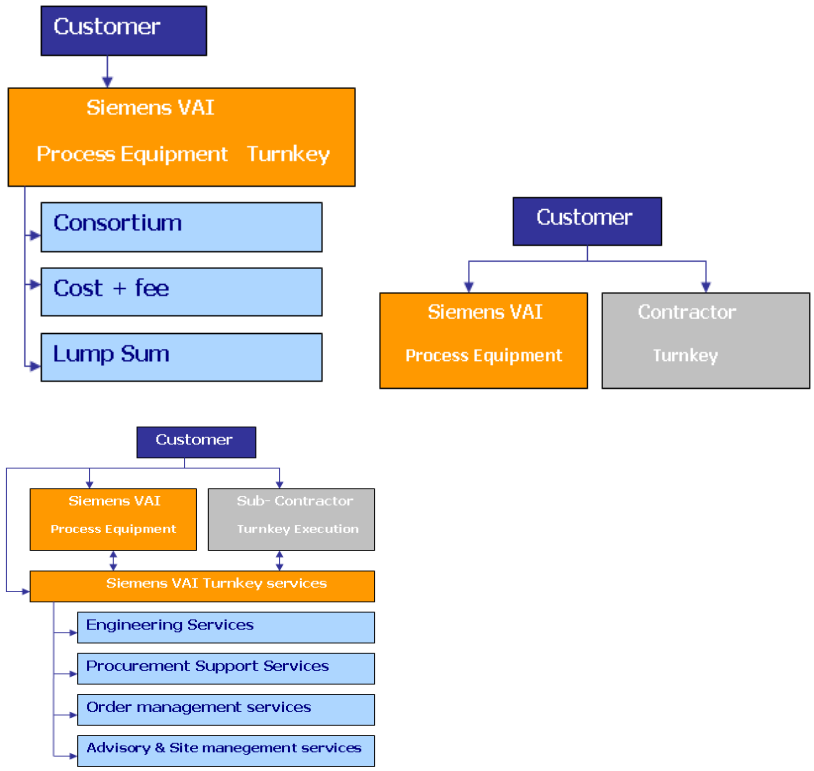


Figure 3: Models of: Lump Sum Turnkey (L), Technology Supply (C), Service Turnkey (R)

In general, every type of Investor has the orientation to choose a specific contract model:

- Institutional Investor: while having the potential capabilities to manage efficiently contracts for technological packages supply and to integrate them autonomously in a global turnkey plant, due to of its awareness of the detrimental impact of the local factors, it tends to use its market predominance to impose lump-sum turnkey contracts.
- Private Investor: the budget limitation, the lean organization and the lower market strength address it to adopt the technological packages supply contract model.
- Financial Investor: with huge limitation in staff and in specific business knowledge, it prefers to have turnkey contracts but with lower negotiation strengths than the Institutional Investor.

The implications of both these types of contract models for the Contractor “Siemens Metals”, in terms of sales volumes, financial risks and “added value” to-and-from the project (i.e. organizational setup, market visibility, business driving effect, partnerships, etc), have diminished the attractiveness and the strategic sustainability of the plant construction in the world market context.
Siemens has proposed to the market and successfully applied other two models of projects execution contracts.

Process Turnkey model: Siemens supplies an enlarged core technological portion (core rolling mill equipment and related services plus some additional non-proprietary main packages, typically RHF, WTP, WKS) integrated by the basic design data for the remaining BoP[2] items to complete the turnkey plant. The Customer maintains the opportunity to choose the turnkey contractor.

[2] BoP, Balance of Plant

Service Turnkey model (Figure 3): the direct scope of supply Siemens is enlarged beyond the pure core equipment as for the Process Turnkey Model but integrated by the basic or detailed engineering for the remaining BoP items including BoQ[3] estimations and other supporting technical specifications, by the preparation of technical and commercial documents for tendering, by the leading scouting and ranking of the identified suppliers, by the backing for the direct Customer's negotiation and orders to the suppliers. Such technical and commercial commitment is then completed by an overall supervising service of the totality of the project, acting indeed as a Service General Contractor or more precisely as the Service Project Manager of the Customer. The huge acquired project management experiences in the field of the steel plant and of the linked businesses, together with the structured engineering and SCM organization of the Siemens group, offer to Siemens the opportunity to exploit the service and supply partnership with the Customer beyond the pure EPC phases also in the FEL and in the PO phases. As evidenced in Figure 2, this model is particularly suitable for projects with financial or private Investors demanding to the Contractor a higher level of management coordination and leadership.

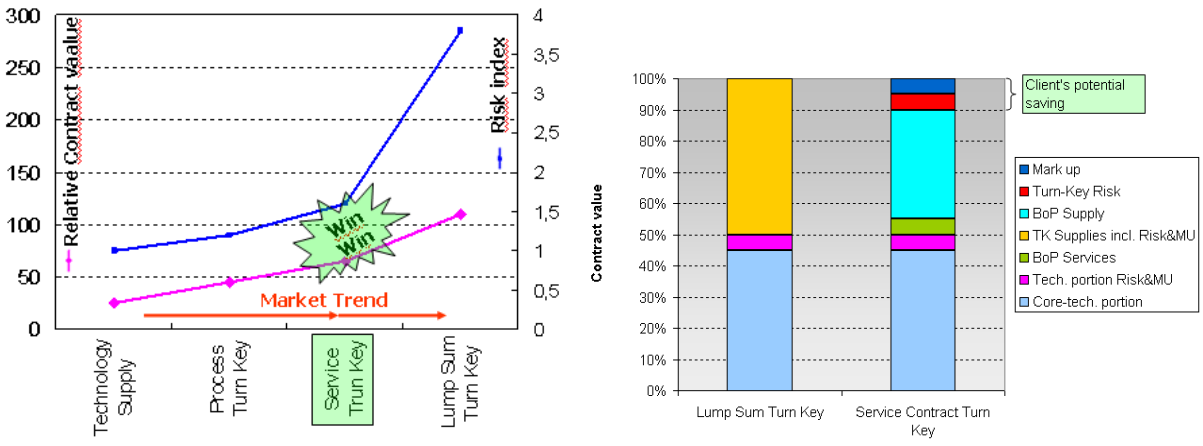


Figure 4: Comparison of relative contract values

The graphs in Figure 4 show the typical order of contract value for the different contract execution models together with the associated risk index for Siemens depending on its role, ranging from that of simple technical supplier to that more risky of full general contractor.
The Service Turnkey model results sustainable to Siemens due to the more balanced risk vs. sales ratio while offering at the same time objective technical and economical advantages also to the Customer; in fact with this manner of execution, Siemens provides the Customer with all the technical and project management services of a general contractor but without marking up on the total of the turnkey packages and excluding the "risk balance" hedging.
Such values remain as potential savings to the capital investment of the Customer.
The Service Turnkey contract model results to be a real win-win project-solution concept. This concept is depicted in Figure 4 as well.

[3] BoQ, Bill of Quantities

DISCUSSION

Project models comparison based on the ROI indexes

The more suitable manner to have an objective comparison about the effectiveness of the different models of execution of a project is based on the Return on the Investment index (ROI = ratio between profit and capital investment).
For this specific kind of industrial projects it can be determined by combining the three typical KPIs that are the investment budget, the overall project-life-cycle time (FEL + EPC = time-to-market) and the plant operational efficiency (production ramp-up and stability in the time intended as ratio between the actual and the nominal capacity of the plant).
Precise KPIs exist for the rolling mill plant implementation, based on market economical indexes and on peculiar experiences of Siemens gained through the execution of a number of similar projects in different contexts worldwide.
An overall project execution performance can be measured looking at the sum of the deviations from the benchmark values of each KPIs assumed equal to 1. A value greater than 1 for the budget and the schedule KPIs means worsening deviation vs. benchmarks, while for plant operability KPI it stands for better than the nominal forecasted target. The combination of the three KPIs, offers a concept of evaluation of the various contract execution models.

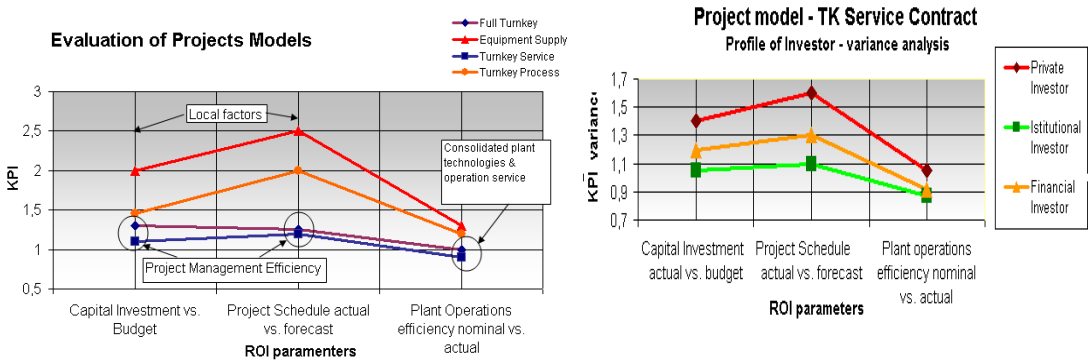


Figure 5: Trend of ROI and ROI vs. investor's profile

In Figure 5 it is shown the actual trend of the ROI parameters as resulting from the various cases of executed contracts weighted on the overall number of projects with the different typologies of Investor. The Service Turnkey model offers the most balanced form of risk management together with the best technical and financial added value performance, especially but no only to those Customers with weak project management organizations, limited strengths and experiences in the field. The graph in Figure 5 indicates that there are still significant gaps of performance vs. benchmark (KPI = 1) depending on the profile of the Investor and on its capacity to manage the project complexities with the influence of the local business factors; anyhow it must be highlighted that the gaps vs. benchmark are consistently reduced respect to those evidenced in the previous graph when executing other contract models without a Project Management partnership with Siemens. The peculiar strength of this model is the merged perspective and target of the Customer, basically market oriented, and of Siemens Contractor, project execution efficiency oriented.

CONCLUSION

Operative Project Management hints within the PM@Siemens model: the dynamic programming prospect

The described project execution context with a degree of risks for the Investor and the Contractor escalating based on the applied contract models, enhances the features of the PM@Siemens project management concept.
The project life-cycle structure is based on Project Milestones and Quality Gates put at crucial points to deliver a set of management decisions. The decision matrix spins around a series of standard tools that setup the backbone of the dynamic programming/monitoring process.
The main tools are the Milestones Trend Analysis (MTA) linked to the Cost Trend Analysis (CTA) and to the Project Risks & Opportunities Concept (PROC): they work in parallel with categorized assessments applied iteratively at each project phase or in presence of specific disturbing events.
The MTA is a project time-efficiency indicator tracking the status and forecasting the development of the main project events vs. target dates, thus allowing a timely reaction to the detected and potential divergences (see typical MTA graph for Service vs. Process TK contract, in Figure 6).

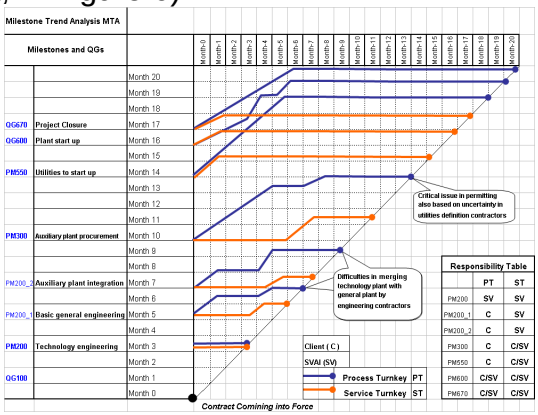


Figure 6: Comparative MTA: Service Turnkey vs. Process Turnkey

The CTA is used to breakdown the potential variance of a project into a packages cost variance vs. budget and a performance variance vs. schedule: it ensures that the cost and the schedule components are not mixed as in the case of a conventional planned/actual comparison.
The PROC, a risk management tool, is structured in modules: risk /opportunities identification (standard database), evaluation before measure (value and probability), setting measures (responsibility, timing, status, and cost), and evaluation of residual risk after measures.
It is initiated already in the bid-phase as an essential part of the project categorization process and of the change management.
A structured Product and Project Management system can offer consistent opportunities to handle dynamic and challenging business context. The Service Turnkey contract model represents an innovative and efficient solution of execution offered to the Customers enhancing the wide ranging skills of excellence of Siemens and emphasizing the importance of a joint responsible approach.

REFERENCES

- A. Villa - (2001) - Project management di committenza degli investimenti impiantistici - Impiantistica Italiana (Italy)
- L. Schiavina - (2006) - Metodi e strumenti per la modellizzazione aziendale - Franco Angeli (Italy, Milan)
- Metals and mining magazine - (2008) - Siemens AG (Germany, Erlangen)
- PM@Siemens (2007) - Project Management Handbook - Siemens PM Academy (Germany, Erlangen)
- Siemens Corporate Quality Management Seminar - (2005) - (Germany, Munich)
- Short on steel (2008) - Construction World (United Arab Emirates)
- www.GulfConstruction.com