

WHAT DO YOU MANAGE- PROCESSES OR PERSONNEL FOR BUSINESS PROCESS DEVELOPMENT: A CASE STUDY IN PROJECT BASED INDUSTRY

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1. INTRODUCTION

A project involved hundreds, indeed thousands, of activities , where many suppliers and sub-suppliers (and their sub-suppliers) are linked to meet the requirements of a particular customer. The definition of project may vary according to the type of the projects. For example, one project might involve the development of a new product, whereas another project might involve the delivery of a product or service to a certain port or site on the other side of a country. Projects involving engineering, procurements, and construction, and which involve the installation of product, are called EPC projects. Those projects that also involve the operation of the product for a certain period of time, and therefore involve the development, construction, and ownership of the product, are referred to as DCO projects. In this study, a project is: “a group of inter-linked activities with a starting and finishing point, in which human, financial, and material resources are organized in such a way as to undertake a unique scope of work, of given specification, within constraints of cost and time, and requiring a central intelligence to direct it”.

EPC projects have become quite common in recent decades, and it has become a successful mode of business operation, particularly in developing countries. Because less-developed countries depend upon foreign financial agencies for aid, and because these agencies are in the driving seat, they often make recommendations to local actors on EPC deliveries to minimise the risks involved. Such deliveries represent one of the dominant modes of international business today (Hadjikhani, 1996). The increased complexity of systems and the need for standardisation of the offerings of many international companies implies that organisations have to develop their business capabilities and competencies to handle even more complex EPC projects that include both tangible (products) and intangible (services) aspects (Grönroos, 1997). Behind this complexity, there is a rapid development of technology, particularly information technology (IT). This is driving the change in business processes and involves the dissemination and productivity of knowledge, a focus on quality, and responsiveness, and adaptation to strategic planning, globalisation, outsourcing, partnering, social and environmental responsibility, and a flexible customer interface.

Research on industrial networking has burgeoned in recent decades (Imai, 1989); (Håkansson, and Snehota, 1995); (Kock and Björkman, 1995); and some guidelines have been suggested for business processes (Tikkanen, 1997), but it is surprising that very little research has been done on EPC projects. It is even more surprising that we can find no evidence of research on network base connections in such deliveries. The aim of our research is to develop a framework for business process development in project based industry (PBI). In particular, I wish to develop an appropriate framework for global business process development in project-based industry. To do so, I must address the question of the key activities involved in business processes of PBI and, in particular, the power plant project business. In that context, emphasise is how a network approach be more effective in such developments.

2. BUSINESS PROCESS DEVELOPMENT APPROACH

The process development approach was actually introduced 17 years ago by Porter (1985), with the objective of improving cross-functional interaction. However, Porter presented the concept of interoperability only in terms of the value chain. Hammer and Champy (1993) were the first to present the process-oriented concept as an essential element of organisational development. They defined business process as “a collection of activities that takes one or more kinds of input and creates an output that is of value to the customer”. Davenport (1993) defined it in terms of a “process is simply a structured set of activities designed to produce a specified output for a particular customer or market”. Laakso (1997) restructured the definitions with the additional resources needed in accordance with the original concept of the networking approach (actor, activity, and resource) defined by Håkanson (1982). Processes in a project have a beginning, an end, and clearly identified inputs and outputs, whereas process development seeks their overall business performance. Processes are classified according to the position of the process owner, or department, in the hierarchy of the process. For example, processes in PBI can typically be categorised into different process levels—such as the management process, concept development, engineering, the supply process, transport and logistics, construction, operation, and the maintenance processes of the plant. The basic principle of business process development, as articulated by Hammar and Champy (1993), is expressed by such questions as: “Why do we do what we do?” and “Why do we do it the way we do?”

In PBI, processes are usually groups of activities that result in products or services, which eventually generate revenue.

A business process is a series of tasks, which consists of activities to design and produce a product or services. Task is an independent function but it links with many other activities, and the development of a process will have an effect on the overall flow of processes. For example, if the sales department is not interested in redefining the tasks, this will affect the other actors as well. Synergetic efforts are required to ensure an overview of the whole process. The basis of the process view is embodied in the principle that, for organisations to be more efficient and effective, the various functional areas need to work together towards a common goal.

To focus the present research, I limit the definition of process development to the view that business process development is a systematic way of working in which actors interact and measure the performance of the activities that consume the resources necessary for the completion of a project for a particular customer. This means that systems development is an *integrated* activity, which emanates from the simple fact that processes affect more than one part of any organisation. Therefore, cross-functional teams are required and systems need to be developed.

Process management is essential at the organisational level to support top management. To be successful, it is necessary: (i) to involve all personnel; (ii) to form process development groups; and (iii) to ensure compatibility of IT. A clear definition of process development for a given project will significantly improve the chances of its success. For the more strategic processes, visionary leadership is required. Many companies are doing well, both in the marketplace and internally, but still need to develop processes to ensure success in the future. To update routine tasks, teams should organise frequent meetings on project work, innovation, and resource search skills, and a visionary leader is required to provide a strong leadership role

The basic processes of a project-based industrial organisation can be categorised into: (i) the strategic process; (ii) the functional process; and (iii) the administrative process.

- The *strategic process* is composed of the functions of formulating the strategy and designing the organisational structure. This process demands not only an external analysis, but also an internal analysis. The strategic process collects and manipulates a great deal of information in order to elaborate corporate strategy.
- The *functional processes* are driven from the strategy of the company—which describes the procedures required to perform tasks and presents guidelines on how to carry out those tasks. Mechanisms describe the activity's purpose and goals, and the means by which the input and output of functions are measured.
- The *administrative process* helps in the implementation and control of the development of the functional processes. Hence the approval of any change in the process is required from process owners.

In this paper, I discuss only the second of the above three basic processes. The functional processes are therefore the focus of this study.

The definition of processes has made some inroads into practice during the past decade, and has extended to process modelling, simulation, and automation, as understood in the context of the organisation's larger business processes. A second trend in response to the knowledge society has been the creation of knowledge-based organisations that are enhanced by integration of the rapidly evolving developments in IT. This implies that business processes are independent variables and depend upon the latest knowledge and experiences embedded in human relationships, systems, structures, and networks.

The success of carrying out a project is the outcome of how well one can plan, execute and control the tasks and how well one can manage the relationships with all the stakeholders that are involved to the project. On the parallel there is also need to understand the degree of complexity with which the project is confronted. Defining and understanding *complexity* is essential before one can address the question of how to manage it. The complexity as defined by Herbert (2001) is as a system "made up of large number of processes that interact in non simple ways" ... given the properties of the process and the laws of their interaction.

De Meyer, Pich, and Loch (2002) observe two major sources of complexity in projects through their detailed analysis of 16 case studies: tasks complexity and relational complexity.

- *Task complexity* refers to the number of interacting components or tasks of a process. These can be activities in the traditional sense, or, more generally, distinct influences of a process. Network activity

techniques, e.g. PERT, the critical path method, the use of Gantt charts are often used to handle this tasks complexity.

- *Relational complexity* is caused by variety of multiple stakeholders with conflicting interest. These conflicting interests can lead to disagreements and about project goals and about priorities among tasks and feature of the project outcome.

The concept of complexity is described in diverse fields spanning natural and manmade systems in manufacturing, computer systems, and organizational structures. In order to understand tasks and relationship complexity, I stimulate a new dimension as “process competence areas” rather a narrow-minded approach of departmental process development. As different *process* steps may have multiple and difficult to understand interactions; this is interaction complexity which refers to the fact that the different process steps cannot be separated without affecting overall *process* performance. The management of complexity during the life of a project is the influence parameter that is the one that is better understood, but it is not really the focus of present paper. I believe in this contemporary world of digitalization (CRM software, ERPs, ARIS, etc.) one should be able to considerably transform processes in project business, despite the uniqueness, discontinuity and complexity features of the type of a project.

3. BRIDGING THE GAP WITH NETWORK APPROACH

Challenges in new business environments provide new business opportunities—in the form of new products, more efficient processes, networked businesses, and alternative information distribution channels made possible by IT. As the demands of customers change, competition in the market means that processes need to be modified. In other words, flexibility is vital. Hence the question is not *whether* companies should continually modify their products and processes, but *how* they can manage such change in a rapidly changing environment, and thus bridge the gap between existing models and reality.

In such an environment, networked business processes create products and services of value for customers. Many parties cooperate and do business together in networks to accomplish these products and services. For example, customers have been demanding a complete power plant based on reliable warranties for several years. Parties including customers, financiers, insurance companies, component suppliers, and their sub-suppliers, transport companies, logistics providers, and possible intermediaries can all cooperate in this business transaction. The internal business processes of these companies must synchronise their activities to deliver this service effectively.

Franken, H., Bal, R., Janssen, W. and de Vos, (2000) has said that a business network consists of the cooperation of actors in a chain to produce products and services of value for the end customer. The network is integrally managed regarding organisation, procedures, and technical systems. Business networks can be considered to be the *horizontal* integration of the main processes to handle each customer engagement with guaranteed service. *Vertical* integration, in contrast, focuses on integrating and optimising each separate business function to achieve cost-efficiency. Indeed, responsiveness, quality, and cost are service parameters in the network design.

The industrial network approach requires an effective communication system, which in turn, requires information and knowledge management. Industrial networks consist of network as relationships, network as structures, network as position, and network as process. A network as process exists when strong inter-organisational relationships occur—which means that coordination emerges. But such coordination cannot be achieved easily or hierarchically because organisations are too independent, and difficulties in synchronisation always exist.

Each individual knows his or her task within the company, and each aims at executing this task as efficiently as possible. However, project-based industry is not judged by individual tasks. Rather, it is judged by the execution of business processes in the successful completion of a project. A single individual needs to look at the project as whole. These processes involve cooperation, dependencies, different roles, and the various contributions of people, resources, and information. Insight into the entire chain of activities will uncover bottlenecks and enable employees to anticipate and control these events themselves. This is why process development takes the entire chain or network as its starting point.

Thus, networked business processes are linked across internal and external organisational boundaries. To design networked business processes and supporting IT-systems, it is essential to take the paradigm of customer-to-customer processes. Such processes need integrated management functions for the entire chain to coordinate and synchronise all activities successfully. Håkansson, and Snehota, (Eds.) (1995) have clearly identified three main aspects of innovation in a network perspective—(i) knowledge development; (ii) resource mobilisation; and (iii)

resource coordination. The present author believes that these three aspects are essential for business process development.

4. A CASE STUDY AT WÄRTSILÄ FINLAND OY

4.1 company background

Wärtsilä Corporation, one of the world's biggest power generating equipment and EPC project suppliers is leading in ship power generation and a major provider of solutions for decentralized power generation and for supporting services with over 10,500 employees in some 60 countries at the end of year 2002. Headquarter of the Corporation is located in Helsinki, Finland. The group divides its business operations into three divisions: Marine, Power Plants and Services. The divisions are responsible for their respective business worldwide. Wärtsilä has its R&D and production facilities in Finland, Holland, France, Norway, India and USA.

Wärtsilä Group's net sales has decrease by 5% in year 2001, which was EUR 2,358.7 million and the operating profit was EUR 527 million. Power Plants contributed 35% of the total sales, Marine 27%, Service division 36% and Imatra Steel 2%. Return on investment in 2001 was 43%.

Wärtsilä provides complete solutions for power generation and marine propulsion. The company designs, manufactures, licenses, sells and services Wärtsilä and Sulzer engines with unit outputs of 500 - 80,000 kW, and installations based on them. The engines can be run on heavy fuel oil, light fuel oil, gas and new fuels such as Orimulsion. Wärtsilä delivers gas and oil fired power plant solutions from 1 MW to 300 MW, these power plants are used for base load, load management, cogeneration and gas generation applications. Deliveries include EPC and long-term maintenance and operation. In October 2001, Wärtsilä acquired a biopower company Sermet to offer biopower solutions for the customers.

4.2 business process development at wärtsilä

The project division of Wärtsilä Finland Oy launched an activity-based business process development project on 29 March 2000, forecasting new challenges to be faced in the future. The main objective was "Information Enabled Activity-based Project Planning and Execution" (IEAPPE) throughout the lifecycle of a project. The goals were to formulate a common way of working, to standardise project delivery globally, and to implement these changes successfully. The aims were to help process owners leverage information and knowledge assets, and to establish a common way of working in the most profitable project portfolios with a view to continuous process improvement (CPI). In addition, the IEAPPE approach advanced key performance indicators (KPI) beyond traditional development—to enable cross-functional communications and multi-functional assessment of project returns and risks. The aims of the project were to identify and eliminate non-value-added works and to reduce corresponding costs, while continuing to construct power plants. Many companies use activity-based processes as the foundation for development because business processes consist of actors, activities, and resources—all of which produce costs. A similar approach was adopted at Wärtsilä's power division. During the project initiation phase a steering committee was formed and process owners were identified. Dependent variables of the processes were identified, such as resource availability, project timeline, responsible actors, description, and goal. Typically, teams of stakeholders were invited to a pleasant restaurant filled with masses of 'post-it' notes, large format paper, markers, and an objective facilitator to define the 'as-is' process, to brainstorm potential improvements, and to document new improved practices. This work often resulted in increased efficiencies, reduced redundancies, decreased cycle-times, and allowed the selection of 'low-hanging fruit'.

Process mapping was considered to be too difficult. It was thought by some that it might be "a waste of time" or "out of fashion". Recent interactions with major players in a power plant showed such reactions, and even after the passage of some time one could notice tension in discussions among process owners as a result of the old hierarchical approach. But this at least means that actors appreciate the importance of process-focused organisations in the future. This is further evidenced by the fact that hundreds of millions of Euros have been spent, and a whole industry has been built around the business of helping companies to understand and improve their processes.

We subdivide the goals of all process tasks into process-competence areas, as shown in Figure 1. At this stage, process formalisation is counterbalanced with process creation by leveraging individual knowledge through interaction and by reconciling diverse perspectives. An organisation that supports information sharing and knowledge creation among its members, and that is committed to including and reconciling multiple viewpoints, is likely to establish effective and efficient processes, as well as improving its organisational life. The reviews are carried out during the different phases of the project hierarchy. This is a critical path, and the reviews serve as gates or checkpoints before entering into the next phase. These gates screen the non-value-adding activities with a view to ensuring the correct use of resources and enhanced productivity.

Business Process Development in EPC projects

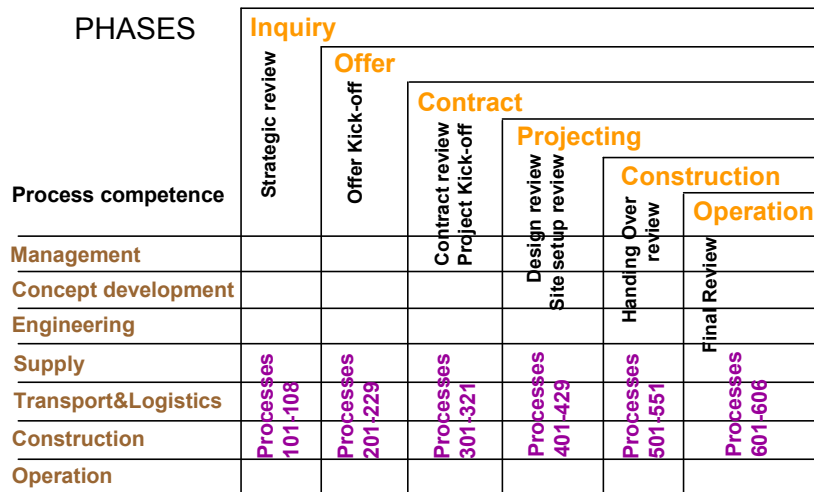


FIGURE 1: INFORMATION SHARING CHART IN BUSINESS AREAS OF EPC PROJECTS

In identification of the business processes, the study of work tasks and functions is defined as follows:

- “Process competence area” which is an independent from organisations and corresponds to best practises
- “Reviews” wherein the critical information and relevant data is communicated to ensure full involvement and utilisation of the organisation capabilities and competitive edges, to minimise risks and get full return of efforts. Reviews are considered as critical path or gates to screen the process.
- “Phases” between reviews, representing a period of activities, to reach the goal of the phase, which is an inquiry, offer, contract, projecting, construction and operation.

At the start of the project, it was mapped around 300 main tasks, which were engineered to 140 tasks—from the inquiry phase to operation and maintenance of the power plant. A list of process tasks is shown in Table 1. Processes with Id from 101 to 108 represents inquiry phase, 201 to 229 belong to offer phase, 301 to 321 are the tasks during contract phase, 401 to 429 is projecting phase, 501 to 551 are the processes during construction phase, while 601 to 606 is the final phase operation of a power plant project.

TABLE 1: BUSINESS PROCESSES IN A PROJECT-BASED INDUSTRY

ID	Process Name	ID	Process Name	ID	Process Name	ID	Process Name
101	Business opportunity	229	Pricing of offer	414	Basic EG-set engineering	520	Project follow-up
102	Conception / plan	301	Share holder agreement.	415	Basic design review	521	Progress reporting
103	Preliminary country study	302	Setting up SPC	416	Internal Order Specification	522	Selection of site personnel
104	Budget estimation	303	Negotiation of PPA	417	Purchase Order Specification	523	Company licensing
105	Project structure	304	Negotiation of IA	418	SUPPLY processes	524	SUBCONTRACTING (site)
106	O&M business plan	305	Finalizing of EIA	419	Planning export doc.	525	O&M mobilization plan
107	Strategic review	306	Negotiation of FSA	420	Project follow-up/ Progress re	526	O&M Procurement
108	Operational strategic review	307	Negotiation of Land	421	Progress reporting	527	O&M Purchase specification
201	Appointment of a "TEAM"	308	Negotiation of EPC	422	Selection of site personnel	528	Site set-up review
202	Pre-feasibility assessments	309	O&M Review meeting	423	Company licensing	529	Site account and bookkeeping
203	Site inspection & selection	310	O&M Sales Negotiation	424	SUBCONTRACTING proc.	529	Gen-set installation
204	Detailed country study	311	Doc. for construction permit	425	O&M Esta. mobilization plan	530	Installation, Mech & auxiliary
205	Define time schedule	312	Contract review	426	O&M Procurement	531	Installation of building equip
206	Load study Handling	313	O&M Contract signing	427	O&M Purchase specifica.	532	Pipe installations
207	Offer kick-off	314	Construction permits etc.	428	Site set-up review	533	Plant finishing
208	Specification of project	315	EPC agreement	429	Site account and bookkeeping	534	O&M manuals doc. Evalu.
209	Preliminary action plan	316	Negotiations of Guarantees	501	Detailed mech. engineering	535	O&M manuals creation
210	Creation of F. Proforma	317	Finalizing financial agreemen	502	Detailed electrical engineering	536	O&M manuals content review
211	Site survey	318	Invoice for down payment	503	Detailed civil engineering	537	O&M manuals Printing & D

212	EIA Handling	319	N.T.P. and down payment	504	Detailed EG-set engineering	538	O&M manuals final review
213	EIA Reporting	320	Internal Notice to Proceed	505	Detailed design review	539	Collection of "As Built" info
214	Risk mitigation & pricing	321	Projects kick-off	506	Update of Detail engineering	543	O&M Notice to proceed
215	Information memorandum	401	Sales of equity	507	Manuf. Electrical equipment	544	Punch list handling
216	O&M EPC Scope review	402	Planning and start SPC	508	Manufacturing, EG-set	545	Handing over review
217	Search for equity partners	403	Detailed execution plan	509	Manuf. Mechanical equipm.	546	O&M Handing over review
218	Preliminary transport check	404	Site reception	510	Manuf. civil equip & materials	548	Pre-commissioning
219	Preliminary execution plan	405	Appointing O&M manager	511	Manuf. Install. material	549	Commissioning approval
220	Drafting EPC offer	406	Design review	512	Quality inspection	550	Commissioning (start-up)
221	Engineering start-up meeting	407	Design kick-off	513	Issuing export doc.	551	Demobilization and closing
222	Preliminary engineering	408	Plant process engineering	514	Checking of subcontractors	601	Handing over Review
223	Preliminary shipping data	409	SPC Main contract. managmt.	515	Site safety and healthcare	602	Commercial operation
224	O&M Offer preparation	410	Site budget preparation	516	Site security & environmental	603	Warranty management
225	EPC price calculation (QQ)	411	Basic mechanical engineering	517	Site and site personnel insur.	604	Customer satisf. Follow-up
226	Subcontractor budgetary offer	412	Basic electrical engineering	518	Mobilization	605	Warranty/ contract ending
228	Offer review	413	Basic civil engineering	519	Transportation insurance etc.	606	Final review

These 140 tasks were analysed and collected on 140 pages on which work descriptions were noted through personal in-depth and group interviews with more than 80 experts in the corporation. Telephone calls, e-mails, and face-to-face meetings were used to gather the data. These modern ways of working were screened in the presence of panels and responsible area directors. Teams of individuals from various departments developed the recommendations. The data were gathered on a Microsoft Access database because of its automatic updating of reports and quick accessibility to all networking companies through the Internet. One valuable by-product, although unexpected by the personnel involved, was quick access to the right documents for the right activity—something that was which lacking in earlier systems. To improve the processes and to coordinate information and knowledge, the company had to develop a systematic approach. The main processes involving direct interaction with customers, and the sub-processes supporting these, were identified. A holistic roadmap was employed from start to finish of a project, and all tasks were mapped (see for example Figure 1 and Table 1) in the form of process chart. Each task was articulated on A4-size pages with standard specification. The names of these tasks (101 to 606) are listed in Table 1. Each task was automated through input and output information—consisting of description of tasks, goals and purposes, responsibility, and resources required. Participants in each activity were listed to facilitate communication of the activity and its successful performance. Such a distribution list was of assistance in determining those with whom communication was necessary. Links to existing knowledge and experiences were provided as documents for reference to help the actors complete the activity and save time in doing so. Criticism of the development of a process was open, with ongoing communication with all individuals involved in the process being maintained at all times. Analysing such elements gave the researcher insights into how the process model works. Perhaps the most interesting finding from the study was a lack of correlation among organisations, and a lack of knowledge and experience sharing in any systematic way. The research participants indicated strongly that open communication was an important factor in process development, regardless of the specific project role. Open communication has qualities of a trait as well as a skill.

Apart from these efforts, another tool used to support the implementation of the processes was ISO 9000:2000, which was used as a means of streamlining and eliminating non-value-added tasks. The quality manager's recommendations were directed more towards administrative matters and, of course, his major efforts were devoted to the approaching audit and its documentation.

This type of information-enabled approach is the future of modern companies, with potential to redefine the way in which people currently do their jobs. IEAPPE empowers the rapid sharing, integration, and distribution of information across work groups, thereby breaking down functional silos and creating a higher level of efficiency. For example, sales managers are able to view the integrated activity model while they are generating offers to determine if the net impact is driving project costs in an undesirable area. Design engineers will be freed from data entry work and will focus instead on the management and evolution of model source files and rules. A major problem for project-based industry is the lack of project predictability. IEAPPE will help to increase predictability and reduce delivery time through implementing these systematic management methods. Project managers will plan project execution more effectively by quick analysis of the existing data.

5. CONCLUSION

In this article, a process-oriented model was presented in EPC projects and identified different stages of processes at different levels of activity in different business competence areas. This is a new concept development for management whereby relationships between a corporation and its business process areas are

identified. A new common way of working on the bases of core competencies and business opportunities will facilitate the development of business processes, and new web-based document systems will improve communication within a virtual organisation. By using ready-made samples for the work required, personnel will be assisted in reducing lead times, and in eliminating activities that do not add value. Applying a global way of working using common terminology will lead to increased flexibility, with resulting responsiveness to customer requirements.

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