CUSTOMISED PROJECT MANAGEMENT METHODS AND THEIR APPLICATIONS IN SHIPBUILDING PROJECTS

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ABSTRACT

Shipbuilding is a project type production, which creates a unique product. Building such a unique product requires many processes to be managed orderly and carefully. Therefore, a systematic project management methodology is essential to complete the project on time and using the proposed resources.
In this study, the utilization, practicality and usefulness of PMI (Project Management Institute) project management methodology, in shipbuilding project management is investigated. The first section of the study includes the purpose, scope and related literature review. In the second section, the general knowledge is given about the project management standards. The third section covers the discussion of each PMI project management process for shipbuilding projects in Turkish shipyards. The conclusion and recommendations are given in the final part of the study.

Key words: PMI, Project Management, Shipbuilding.

1. Introduction

The importance of management of shipbuilding is increasing; including delivery times, cost, productivity, performance, etc. Projects are getting more complex in naval vessels and offshore units with additional rules and regulations, owner demands, etc. Therefore, naval architects and marine engineers are required to know how to manage the different processes of shipbuilding projects with modern tools and techniques.

Turkish shipyards are organized to utilize subcontractors for workmanship supply and rely on global market for the material and equipment supply. Therefore, the major issue of a Turkish shipyard is to manage the resources and organize the work.

Although the history of modern shipbuilding reaches to 1980s in Turkey, the modern techniques of project management are rarely used. All those circumstances require a systematic approach for managing the shipbuilding projects. In this study, it is aimed to investigate the utilization of a globally known project management standard in Turkish shipbuilding industry

There are several studies in ship production time and cost planning and control. However, no researches were found in ship production for utilizing a project management standard as a management approach.

The major constraint is generally the limited time for completing of a shipbuilding project. Some of the studies on scheduling problems of shipbuilding are listed below

- Koenig et al. (1999), studied the modern work break down structures.

- Hameri and Nitter (2002), worked on different work breakdown structures of shipbuilding for engineering data management benchmarking with CERN project.
- Prasad et al. (2003), studied the resource constraint shop level scheduling in a shipyard.
- Saraçoğlu (2005), studied PC based project management. This study is about on software selection for scheduling needs in shipbuilding projects.
- Dalton et al. (2005), investigated the job shop scheduling problems.
- Alkan (2006), worked on the project management effects in ship production on time and cost. Alkan (2009), mentioned that it is not possible to see an overall project management system in Turkish shipbuilding industry. However, according to Alkan (2009), critical path method is used for process planning and control in way of time management.
- Özyiğit (2006), studied on ship production planning with detailed definitions of processes and process flow diagrams.
- Akıncı (2008), studied shipyard production time planning based on critical path method for a specific platform supply vessel.
- Kocabıyık (2009), studied PERT (Program Evaluation and Review Technique) in order to calculate the cost and time for a shipbuilding project.
- Wei et al. (2010) studied the scheduling of outfitting processes in shipbuilding industry.
- Sharma and Kim (2010), introduced a logic based planning for design and production processes in shipbuilding.

Few studies were found in the literature related with other processes of shipbuilding project management rather than scheduling:

- Lee et al. (2007), worked on the engineering risks in Korean shipbuilding industry.
- Ahola et al. (2007), studied the buyer - supplier relations in turnkey shipbuilding projects in way of value creation.
- Karabağ (2009), made a comparison of ERP (Enterprise Resource Planning) systems vs. project management software for shipbuilding industry.

The following section of this paper covers general information on international project management standards, project management standard published by PMI (Project Management Institute) in detail, and the application of this standards in shipbuilding industry.

2. Professional Project Management Standards

2.1 Definition of Project Management

There are several definitions for project concept. PMI (2008), gives the definition as “Project is a temporary endeavor undertaken to create a unique product, service, or result”. The word temporary is not used to mean a short duration of time, but to underline the fact that each project has a beginning and an end. Each project is performed in order to reach its objectives and either completed successfully or terminated (PMI, 2008).

Project is also defined as series of multifunctional activities that require resources with limited budget and have a specific objective within certain specifications (Kerzner, 2009).
P2M booklet (2012) defines the project as “Activities that can actualize desires and dreams within a specific time limit”.

Lester (2007) gives the project definition based on the British Standards as “A unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific objectives within defined schedule, cost and performance parameters”.

Although similar projects may consist of similar or repetitive activities, the result of each project is unique (PMI, 2008). Shipbuilding industry is one good example for unique products. Even two vessels are built in accordance with same design and at the same shipyard; each construction will face with different problems, use different resources, managed in a different way, etc.

Projects could also be performed to improve a company in way of market positioning, complying with legal/environmental requirements or to meet specific customer demands (PMI, 2008)

In order to sum up the major properties, each project:
- Has a specific beginning and end,
- Provides a unique result,
- Is performed to achieve specific objectives or desires,
- Contains complicated set of interrelated tasks,
- Requires resources, and,
- Has limited time and budget

2.2 Standards

A standard is defined as a formal document, which describes norms, methods, processes and practices (PMI, 2008)

Standards are mentioned as repeatable way of doing something, which are agreed formal documents such as a rule, guideline or definition. In order to prepare the standards all available experience, knowledge and expertise are brought together related with the product or service that is subject to standardization (Url-2, 2012).

Standards are designed to create a common understanding of making systems that are safe, reliable and in good quality. Standards could be in the form of codes, specifications, handbooks, guidelines, bodies of knowledge, etc. There are over 1000 globally recognized standard developing organizations in the world, providing over half a million documented standards (Url-5, 2012).

Some of the major standard/rule developing/approving organizations in shipbuilding and marine construction industry could be listed as follows:
- IMO (International Maritime Organization)
- IACS (International Association of Classification Societies)
- ISO (International Standard Organization)
- ILO (International Labor Organization)
- European Committee for Standardization
- TSE (Turkish Standards Institution)
- DIN (German: Deutches Institut für Norming)
- Norwegian shipbuilding standards
- JIS (Japanese Industrial Standards
- ANSI (American National Standards Institute
- API (American Petroleum Institute)
- OCIMF (The Oil Companies International Marine Forum)

There are standards for almost everything including products, services, business, information, technology, human services, energy, water, environment, safety, health, etc. The standards are

aimed to provide applicable ways of performing the tasks, producing the product or providing services (Url-5, 2012).

As mentioned in the previous section, the structure of standards for project management is highly improved by the last 20 years. Having differences between each other, the major items covered within the project management standards are as follows (Ahlemann et al., 2009):

- Terminology is used to provide a common language,
- Functions are defined for what should be done
- Process descriptions are given in order to sequence and detail the functions together with necessary inputs and outputs,
- Organizational models are described in order to understand how the project will be managed within the company.

2.3 PMI – PMBOK

The PMI (Project Management Institute) was established in 1969. PMI is the largest professional community working on promotion, maintenance, and advancement of project management practices worldwide. The certification department of PMI holds the International Standards Organization (ISO) 9001Certification. Therefore, the quality of PMI certification is approved (Lopez, 2005).

PMI is a non-profit organization with about 500.000 members in over 185 countries. PMI combined the knowledge, experience and common practices to set the basis of project management and related activities and certifies the eligible members. There are six certification offered by PMI (Url-4, 2012):

- Certified Associate in Project Management (CAPM)®
- Project Management Professional (PMP)®
- Program Management Professional (PgMP)®
- PMI Agile Certified Practitioner (PMI-ACP)SM
- PMI Risk Management Professional (PMI-RMP)®
- PMI Scheduling Professional (PMI-SP)®

PMP credential is a stand-alone professional credential and considered as the most important certification that is accepted by global market. A PMP may provide project management services in different sectors within different positions such as project managers, project team leaders, project team members, project office managers, and project schedulers (Lopez, 2005).

PMI issued 12 standards that are developed and updated by thousands of volunteered project professionals all around the world (Url-4, 2012):

- A Guide to the Project Management Body of Knowledge (PMBOK Guide) Fourth Edition
- The Standard for Program Management - Second Edition
- The Standard for Portfolio Management - Second Edition
- Organizational Project Management Maturity Model (OPM3) - Second Edition
- Practice Standard for Project Risk Management
- Practice Standard for Project Configuration Management
- Project Manager Competency Development Framework - Second Edition
- Practice Standard for Earned Value Management - Second Edition
- Practice Standard for Work Breakdown Structures - Second Edition (Reaffirmed)
- Practice Standard for Project Estimating

- Construction Extension to the PMBOK® Guide - Third Edition
- Government Extension to the PMBOK® Guide - Third Edition

The PMBOK Guide (A Guide to the Project Management Body of Knowledge) is the foundational project management reference for its professional development programs and certifications. The PMBOK Guide is an approved American National Standard and identified as ANSI/PMI 99-001-2008 PMBOK Guide (PMI, 2008).

The PMBOK Guide is formed by project management knowledge that is generally recognized as good practice. The definition "generally recognized" is used to mention that this knowledge could be applicable to most of the projects. On the other hand, the term "good practice" is used to define the tools and techniques that are agreed to be successfully applied to several projects. However, even a tool or a technique is a good practice, it does not mean that it should be applied to every project in the same way, but they should be modified as per the project and organization needs (PMI, 2008).

In addition, the PMBOK Guide defines a common language for discussing and improving the professional project management discipline. The PMBOK Guide includes 12 chapters. In the first and second chapters the key concepts that are related to project management are given. The third chapter defines the standard for project management, summarizing the good practices of processes, inputs and outputs. In the last eight chapters the details of each process together with related input, tools and techniques, and outputs are described with examples as a guide (PMI, 2008).

The PMBOK Guide is improved within the years. After it was first released as a white paper in 1987, the first edition was released in 1996. Thereafter the PMBOK Guide is improved and published with other editions in every four year.

Apart from PMI standards, there are several global standard giving organizations for project management, such as ISO (International Standards Organization), IPMA (International Project Management Association), AIPM (Australian Institute for Project Management), OCG (British Office of Government Commerce), APM (Association for Project Management), PMAJ (Project Management Association of Japan), etc. The project management methodology given by PMI as PMBOK is selected for this study, due to its common recognition and widely accepted methods of application.

PMI (2008) defines a process as "A set of interrelated actions and activities performed to achieve a pre-specified product, result, or service". Every process is specified with its tools & techniques and inputs & outputs (PMI, 2008).

The project processes are grouped as project management processes and product-oriented processes. Project management processes are performed in order to ensure the effective flow of the project. Product-oriented processes are defined with the specific tools and techniques that are performed to create the required product (PMI, 2008).

2.4 Key Concepts

In order to evaluate the project management standards, set by PMI (Project Management Institute), it would be helpful to understand the approach and assumptions regarding the basic and key concepts of project management.

A project life cycle is composed of project phases that are determined by the management based on the organizational needs, project needs and requirements in the specific field of application (PMI, 2008).

A typical structure for a project life cycle could be given as follows (PMI, 2008):

- Starting the project
- Organizing and preparing
- Carrying out the work
- Closing the project

Figure 1 illustrates the time and cost relation in a project life cycle. Also Figure 2 shows the impact of variables in a project lifecycle (PMI, 2008).

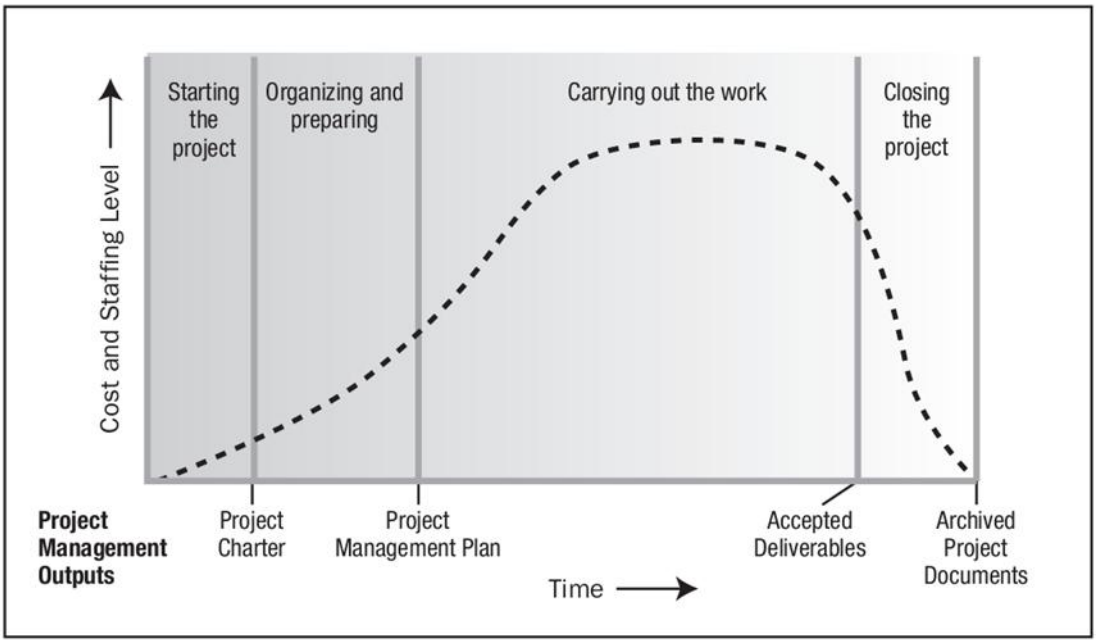

Figure 1. Typical Cost and Staffing Levels Across the Project Life Cycle

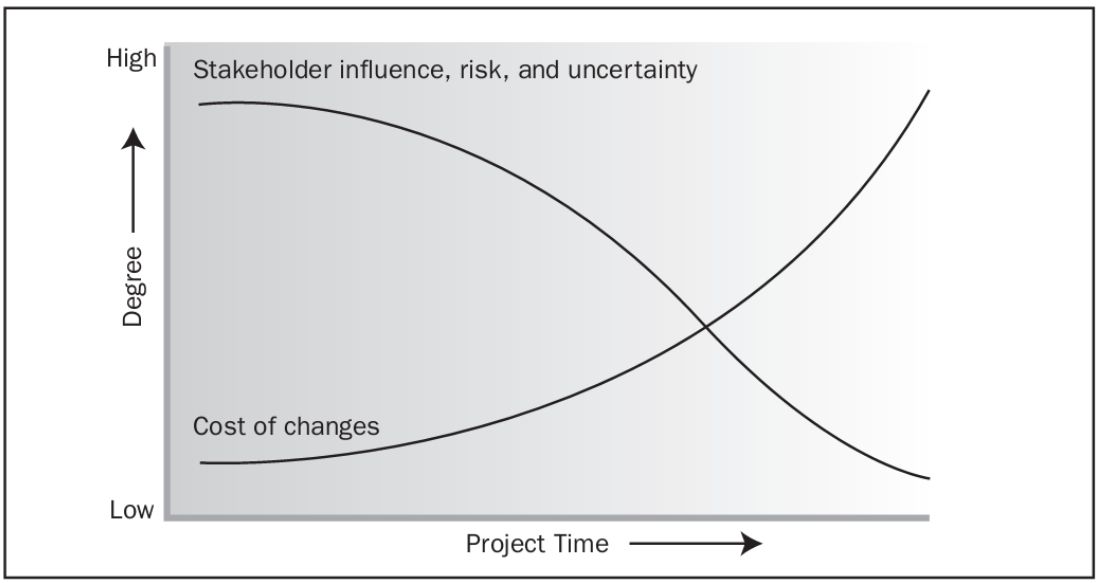

Figure 2. Impact of Variable Based on Project Time

The PMI project management standard includes 42 processes (see Table 1), which are classified under process groups and knowledge areas. There are five process groups namely; initiating, planning, executing, monitoring and control, and closing. The knowledge area covers the management of integration, scope, time, cost, quality, human resources, communication, risk, and procurement. Each process belongs to a process group and a knowledge area at the same time. The details of the PMI project management applications are given in Bilen Doğan (2012).

Table 1. Project Management Process Groups and Knowledge Areas Mapping

Knowledge Areas	Process Groups				
	Initiating	**Planning**	**Executing**	**Monitoring & Control**	**Closing**
Integration Management	1.Develop Project Charter	3.Develop Project Man. Plan	23.Direct and Manage Project Execution	31.Monitor and Control Project Work 32.Perform Integrated Change Control	41.Close Project or Phase
Scope Management		4.Collect Requirements 5.Define Scope 6.Create WBS		33.Verify Scope 34.Control Scope	

Knowledge Areas	Process Groups				
	Initiating	**Planning**	**Executing**	**Monitoring & Control**	**Closing**
Time Management		7.Define Activities 8.Sequence Activities 9.Estimate Activity Resources 10.Estimate Activity Durations 11.Develop Schedule		35.Control Schedule	
Cost Management		12.Estimate Costs 13.Determine Budget		36.Control Costs	
Quality Management		14.Plan Quality	24.Perform Quality Assurance	37.Perform Quality Control	
Human Resources Management		15.Develop Human Resource Plan	25.Acquire Project Team 26.Develop project Team 27.Manage Project Team		
Communication Management	2.Identify Stakeholders	16.Plan Comm.	28Distribute Information 29.Manage Stakeholder Expectation	38.Report Performance	
Procurement Management		22.Plan Procurements	30.Conduct Procurement	40.Administer Procurements	42.Close Procurements

3. PMI Utilization in Turkish Shipbuilding Projects

In this section, the processes defined in PMI project management standard will be evaluated for Turkish shipbuilding industry. Each process will be evaluated for Turkish new shipbuilding projects, specifically for commercial vessels with a turnkey contract. The workflow until the contract signature is briefly explained below.

Generally, the owner seeks for a ready design with a technical specification. There are several design offices, which analyze the market trend and prepare a preliminary design with technical specifications for potential customers. Once the owner finds a convenient vessel that would satisfy

his business needs, he asks for a proposal from the shipyard. A broker generally maintains the contact between the shipyard and the owner. The proposal period could last for months since the owners usually request changes on the specification. Indeed, the major reason that the global owners are choosing Turkish shipyard, is that they require their vessel to be built as custom made. Afterwards shipyard provides its offer based on the revised technical specification including the delivery time, payment conditions, guarantee period, etc. In case the both parties are satisfied with the conditions, usually a letter of intent is being signed. Once the shipyard and the owner arrange the bank guarantees, the contract is officially signed.

In this study, the new commercial ship building projects with turnkey contracts are evaluated. Some industry specialists consider the beginning of the project as the date of first down payment. In addition, some industry specialists consider the project finish as the end of guarantee period which is usually (12) months after the delivery of the vessel. However, in this study, the projects are considered to be started upon the contract signing and end with the delivery of the vessel to the owner.

In the following sections, the utilization of each process for a shipbuilding project in Turkish shipyards. In addition, the opinions of sector specialists will be summarized related with the practicality and usefulness of subject processes.

3.1 Develop project charter for shipbuilding

The inputs of develop project charter are; project statement of work, business case, contract, enterprise environmental factors and organizational process assets.

Project statement of work could be considered as the contractual building technical specification which specifies the ship to be built and the related standards and requirements.

The business case is usually the customer demand, in this case the ship owner`s requirement. However, some shipyards build the vessels speculatively based on the market trend. In addition, some shipyards build their vessels for a shipping company that is usually owned by the same group as the shipyard.

Contract could be considered as the official document signed by the shipyard and the owner, in which the commercial and legal items are mentioned.

For developing the project charter, the expert judgment within the organization could be used. Considering the functional and matrix organizational structure of the Turkish shipyards, the marketing department or the planning department could perform this process with approval of the top management of the shipyard.

The extent of the project charter and the staff to be published may depend on the information policies of the shipyard. Shipyards may keep the contract winning as a secret within the organization for commercial reasons.

Although some of the experts think that the develop project charter process is already used in Turkish shipyard, a majority of the projects are started without such official announcement. Some of the experts even claim that shipyard staff hears about the new project from other parties outside their organization. Some experts think that project charter is better performed by a meeting rather

than a documentation. Either utilized or not, all experts consider that this process will be practical and useful for shipbuilding projects.

3.2 Identify stakeholders for shipbuilding

The major stakeholders and their influence in a shipbuilding project would be more or less the same. Therefore, the shipyards may study all possible stakeholders and define strategies without depending on the project. Thereafter, the related project work for the project manager could be limited with collecting company/contact name details during the project execution. As a reference, some of the major stakeholder groups for shipbuilding projects are listed below:

Owner
Owner representative
Broker
Financial partner
Banks
Designer
Classification Society
International rules and regulations
Potential rule giving private authorities (Exxon Mobil, OCIMF, etc.)
Local government
Equipment and material suppliers
Sub-contractors

Considering the functional structure of shipyards, stakeholder groups could be identified and analyzed by related departments. For instance the equipment and material suppliers by purchasing department, the owner/broker by the marketing department, subcontractors by the planning department, etc.

Most of the industry specialist think that identify stakeholders process is practical and useful in shipbuilding projects. In general, the specialists do not believe this process is being utilized in Turkish shipbuilding industry. However, some specialists declared that in certain shipyards, a broader project file is prepared covering the needs of this process.

3.3 Develop project management plan for shipbuilding

The project management plan is developed in order to integrate the plans related with the project and provides a baseline from the planning processes including the followings (PMI, 2008):

- The life cycle of the project and phases
- The processes to be applied and level of application
- How to execute the work
- Change management plan
- A configuration management plan
- Communication needs
- Key management review for the project

The project management plan gives reference to other subsidiary management plans such as scope, requirements, schedule, cost, quality, process improvement, human resources, communication, risk, and procurement (PMI, 2008).

Since there is no significant systematic approach for project management in Turkish shipbuilding industry, it is difficult to mention the utilization of this process. Supporting this idea, all of the sector specialists think that this process is not performed by the shipyards. However, some specialists think developing a project management plan will be practical and useful for better integration. However, there are also some specialists, who believe preparing a plan of plans will be waste of time and increases the documentation work without any use. The second group believes, shipbuilding projects already involve a lot of documentation.

3.4 Collect requirements for shipbuilding

The outputs of the collect requirements process are; requirements documentation, requirements management plan, and requirements traceability matrix.

The beginning of a project is assumed as the contract signing stage, with turnkey shipbuilding contracts. Considering these constraints, the product requirements and major requirements of the project should have been defined before the project commences.

Therefore, according to the specialists' opinion, this process is not applied. However, considering huge amount of the stakeholders, defining the owner requirements and product requirements may not be easy work according to the specialists. They think this process could be applied and would be useful in shipbuilding industry. A specialist thinks that, building technical specification could be evaluated and each necessary work could be defined based on the requirements mentioned in the specification.

3.5 Define scope for shipbuilding

Likewise the collect requirements process for shipbuilding, the scope of the project is assumed to be defined before the project commences.

Although not exactly covering the definition of project scope statement according to PMI, the building technical specification is considered as a ready document in the turnkey projects.

However, some of the specialists consider the define scope process is necessary, practical and useful in shipbuilding. Because the technical specification may define the product and the way of building it, but it would not mention the additional equipment and lay out change requirements. Therefore, some specialists even consider the shipyard capacity evaluation; lay out convenience, workshop availabilities, etc. Should be considered as another process additional to the ones mentioned in PMI.

This process also covers the kick-off meeting. It may be a useful process for a shipyard, to get the major stakeholders together in order to analyze the different point of views.

3.6 Create WBS for shipbuilding

According to PMI, create work break down structure is the process of subdividing the project deliverables into manageable components (PMI, 2008).

There have been several studies on how to create a WBS in shipbuilding industry. However, those studies mainly focus on naval shipbuilding projects while assuming the commercial shipbuilders

are more flexible in using their own WBS. Author considers each shipyard should have its own WBS template considering the similarity of the project deliverables. The inspection test plans (ITP) issued by the major classification societies could be considered as a good reference for the project deliverables.

A turnkey shipbuilding contract generally covers an exact delivery date. Therefore, most of the industry specialist consider the create WBS process should have been handled before the contract signature including a project schedule without much detail. Therefore, this process is generally considered as partly utilized and useful in shipbuilding projects according to the specialists. However, there are some specialists who claim that there are several shipyards in Turkey, who does not create a WBS and or a project schedule, but gives department managers a full authority on organizing their own work in daily or weekly basis.

3.7 Define activities for shipbuilding

Some of the Turkish shipyards take the define activities process seriously, resulting over thousands of activities for each project. However, according to the specialists, most Turkish shipyards do not define the project work in activity basis, but prefer listing the major steps in a simple list of about 50 items and detailing each work daily by the department managers. Therefore, in general, it is difficult to mention the utilization of this process in Turkish shipbuilding industry. Either utilized or not, specialist believe defining activities is strictly necessary and useful for shipbuilding projects.

Define activities process also covers defining the milestones. Some of the major milestones in a shipbuilding project could be given as:

- The first steel cutting,
- Keel laying,
- Launching,
- Main engine start up,
- Sea trial and
- Delivery

Most of those milestones are also used as a basis for the installments in the shipbuilding contract.

3.8 Sequence activities for shipbuilding

Likewise the define activities process, sequence activities process is used by some of the Turkish shipyards. Activity sequencing depends mainly in physical constraints, but the organizational process assets and shipyard layout are major considerations that define the discretionary dependencies. For instance, the sequence of painting/coating work could be performed right after the block production or when the block erections are finalized. This would depend on the finishing sequence of so-called hot work. The availability of a painting workshop, the extent of block outfitting during the block production, availability of information flow from the designer and or the equipment manufacturers and accuracy of working drawings could be listed as the major items that affect the subject decision.

Either utilized or not, specialist believe defining activities is strictly necessary and useful for shipbuilding projects.

3.9 Estimate activity resources for shipbuilding

In Turkish shipbuilding industry, the production work is performed by the sub-contractors in almost all of the shipyards. Utilizing sub-contractors usually provide flexibility to the shipyards for increasing or decreasing the resources during the project. However, the organizational structure of the sub-contractors are so poor that the shipyards need to control the subcontractors closely in order to avoid bankruptcies in the middle of a project. Shipyards also need to check the payment of subcontractor workers salary and insurance fees due to their responsibility according to the Turkish laws. As a result, although the sub-contractors sign legally binding contracts, very few of them are able to complete the work in compliance with the contract.

On the other hand, the resource estimating related with the shipyard staff and facilities are not performed according to almost the entire industry specialist. While, all specialists consider resource planning is quite necessary for shipbuilding industry.

Some specialists state that, it is getting more and more common to use enterprise resource planning (ERP) systems in shipyards, especially in newly established ones. However, specialists also mention that package software usually makes the works harder for shipyard staff due to lack of good process definitions and limited personnel involvement in the software implementation period.

3.10 Estimate activity durations for shipbuilding

Most of the Turkish shipyards define very few activities and consequently make limited estimations related with the activities. Where estimate activity durations process is performed, the data from the previous projects are used. For important activities, expert judgment from the site engineers is considered.

3.11 Develop schedule for shipbuilding

The inputs of develop schedule are mainly provided from the outputs of define activities, sequence activities, estimate activity resources and estimate activity durations processes. Considering limited utilization of subject processes, it is difficult to mention a proper process of schedule development in Turkish shipbuilding industry.

Most of the Turkish shipyard suffer from the penalties occurred due to late delivery of the vessel to the owner. Therefore, either utilized or not, the industry specialists believe schedule development is very critical and necessary for Turkish shipbuilding projects considering the general late delivery problems.

3.12 Estimate cost for shipbuilding

The beginning of a project is assumed as the contract signing stage. Due to the complex nature of shipbuilding contracts, the major cost estimations are performed before the project commences. Therefore, according to the general specialists' opinion, this process is not applied during the project. On the other hand, some specialist states that the cost estimations and the project budget for each item are considered when contracting for equipment, material and workmanship supply. Sometimes the cost estimations may not be sufficient during contract negotiations and further study might be necessary. For example, the steel construction work is usually sub contracted on

steel tonnage basis. However, when the detailed design is completed and depending on the structural complexity of the vessels, subject estimates might need to be modified.

Most of the industry specialists state that the shipyards suffer from the cost changing contracts with the sub-contractors. Generally, most of the work is finished over the contract price due to rework, additional work, bankruptcies, etc. Therefore, shipyards need to be very careful in sub-contractor selection and make sure of that the sub-contractor understands the scope of work. In this context, the sub-contractor evaluation shall be carefully made by shipyards considering the cost of quality analyses.

3.13 Determine budget for shipbuilding

The beginning of a project is assumed as the contract signing stage. Generally, the shipbuilding contracts involve the total lump sum price for the turnkey delivery of a vessel plus a one-year guarantee or more.

For this reason, according to the industry specialists, the budget for a shipbuilding project should be very carefully determined by the shipyard. Most specialists think that involvement of major shipyard personnel such as department managers is essential during the contract stage of a shipbuilding project.

3.14 Plan quality for shipbuilding

The global property of shipbuilding industry sets most of the quality standards for the ships. A commercial vessel sailing between the international ports needs to comply with several rules and regulations. On the other hand, several quality standards are set for shipyards related with the building practices. Therefore, Turkish shipyards already have several quality requirements to be met related with the product and the some of the shipbuilding processes in technical means.

However, according to the specialists, it is almost impossible to mention a proper quality planning Turkish shipyards. There is an absence of quality standards related with how to perform the work and how to comply the requirements of the project. For this reason, several rework occur during the project due to lack of quality in documentation, management, etc. Specialists consider plan quality is necessary and useful in Turkish shipbuilding industry. However, applicability of this process would depend on the availability and extent of the organizational process assets of the shipyard.

3.15 Develop human resources plan for shipbuilding

Develop human resources plan covers the roles, responsibilities, required skills and reporting relationship for the project team (PMI, 2008).

The human resource requirement in a shipbuilding project mainly shapes based on the organizational structure of the shipyard. Most projects have similar requirements considering the similar processes performed within the project. Major Turkish shipyards take the organizational structure seriously and even some shipyards are publishing the management staff on their company website.

According to most of the industry specialists, Turkish shipyards define the human resource needs within the organization. However, some specialists claim that, even the project team members and responsibilities are defined, subject information are documented.

The author believes the shipyards should consider each team member as a manager who is responsible for completing the required work by coordinating the related sub-contractor in accordance with the shipyard's process assets.

3.16 Plan communications for shipbuilding

Communications are planned in order to the scope, extent and timing of informing stakeholders (PMI, 2008).

Shipbuilding projects involve a huge number of stakeholders with different information needs. Make to order property of Turkish shipbuilding industry increases the amount of revised information during the project progress. A working drawing for example might need to be revised even ten times due to lack of information, classification society remarks, owner demand, process improvement, etc. Therefore, it is critical for a shipyard to make sure that the correct information is used for production. On the other hand, commercial projects require high privacy on business secrets that prevents a project manager to spread all the information in the same extent to each related stakeholder.

Industry specialist think that plan communications process is not utilized in Turkish shipyards. However, they found it necessary, practical and useful if applied in a systematic manner.

3.17 Plan risk management for shipbuilding

In this study, the beginning of a shipbuilding project is considered as the contract signing. Most of the sector specialists believe that the major risks should have been identified during the contract negotiations and shall be managed by preparing a proper contract with the owner, classification society, designer, etc. in order to decrease the impact of a risk by transferring, avoiding and preventing techniques. Industry specialists claim that, project risks are not evaluated properly when the project commences. However, almost all of the specialists find risk related processes very useful and necessary for shipbuilding while the practicality is limited with the organization's maturity level. To sum up, according to industry specialists opinion, risk related processes are not applied, are not practical because the organizational maturity levels, but are very useful and necessary.

According to the specialists' opinion, risks could be considered in following groups:

- Risk that may cause the owner to reject the vessel e.g. deadweight, speed, stability, etc.
- Risks that may cause penalties e.g. late delivery, acceptable capacity shortage or speed reduction, etc.
- Risk that may cause commercial loss e.g. huge rework, etc.

According to some specialists, the major risks should have been considered before the contract signing with the owner.

On the other hand, the operational risks are considered as a different topic and most of the specialists believe shipyard should have defined, analyzed and improve processes to avoid

accidents and hazards. Some of the specialists also believe the HSE (Safety, Health and Environment) issues shall be managed in separate processes in shipbuilding project management.

3.18 Plan procurements for shipbuilding

A majority of workmanship, equipment and material are outsourced in Turkish shipbuilding projects. Although the sub-contractors are available in the local market to meet workmanship requirements; major material and equipment are provided from the global market, mainly from Europe and Far East. Therefore, the author considers the planning procurements are essential.

Although it is not possible to mention a documented procurement plan in Turkish shipbuilding industry, most of the industry specialists believe the procurement work is coordinated in departmental basis and informed to related units via work order systems. Some specialists also believe that a shipyard should have a common procedure for procurement for all projects.

Apart from above mentioned activities there are other items to be covered in order to apply PMI methodology in shipbuilding sector. These are including: direct and manage project execution, peforming quality assurance, acquiring project team, developing and managing project team distributing, managing stakeholder expectations, conducting and administering procurements, monitoring and controling project work, performing quality control, and closing project. The details of those tasks were further discussed in Bilen Doğan (2012).

4. Conclusions

In study, the utilization of PMI project management methodology for Turkish shipbuilding industry is evaluated. The general structure of the industry is discussed and specialists' opinions are investigated related with the utilization, practicality and usefulness of project management processes in PMI PMBOK. Based on a questionnaire and informal interviews, answers are gathered for each process. 16 industry specialists who are experienced majorly in shipyard management, project management, project planning, design planning and production planning areas in Turkish shipyards. General comments and findings related with processes are summarized in knowledge area basis. The shipbuilding project is considered as a new building project with a turnkey contract, where the project starts with contract signing and end with the delivery of the vessel to the owner. All of the evaluations are made from the shipyard point of view. Most of the processed defined in PMI project management standard (PMBOK) would be useful if utilized. However, it would not be practical to start applying all processes at the same, considering the maturity level of the organizations, availability of skilled and educated personnel, cultural reasons and changing market conditions. Therefore, it could be suggested to integrate the already utilized processes in order to increase the project performances. Considering that most of the workmanship, equipment and material are outsourced, Turkish shipyards need to increase their management skills, either by use of project management systems or other applicable systematic means.

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