Project Management of Construction for Submarine Cable Systems

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Abstract: This paper describes, in the first place, a basic example of project team organization and its operation, which holds the key for the successful construction of submarine cable systems. The discussion will be extended to specialized organizations, member's skills and relationship between stakeholders in various cases of projects, such as the system expansion, the capacity upgrade and the consortium project, etc.

1. INTRODUCTION

There are varieties of demands for the submarine cable systems nowadays. While some network owners require high capacity systems, adopting the latest Dense-WDM technologies, others require compact and cost-effective solutions. Thanks to the advancement of WDM technologies, there also exist huge demands for system expansion and/or capacity upgrades of existing submarine cable systems around the world. Due to the globalization of the economy and IT market, the prediction of international telecommunication demands has become more complicated, and the network owners are facing the challenge to secure sufficient capacity over the submarine cable system in a timely manner once they dig up new business opportunities. In addition, large-scale projects often need to be implemented by a Consortium of system suppliers, so that they can manufacture and install the system in parallel to meet the required RFS (ready for service) date of the network.

This paper will try to answer the question how does a project team manage to implement a submarine cable system efficiently under such circumstances, when, who and how shall the processes of the construction work be managed and performed? What are the key factors, which will lead the project to a successful completion? This paper describes, in the first place, a basic example of project team organization and its operation, then the discussion will be extended to specialized organizations for capacity upgrade and consortium project, etc.

2. BASIC PROJECT TEAM ORGANIZATION

The Project team is assigned when the contract or agreement between the system owner and the system supplier for a submarine cable system is coming into force, and is managed to construct the system for keeping the overall implementation schedule.

Figure 1 shows an example of the basic organization of the system supplier for the submarine cable system construction. Although there are several types of project team organization, most of the submarine system projects have been implemented by the project type organization as shown in the Figure 1.

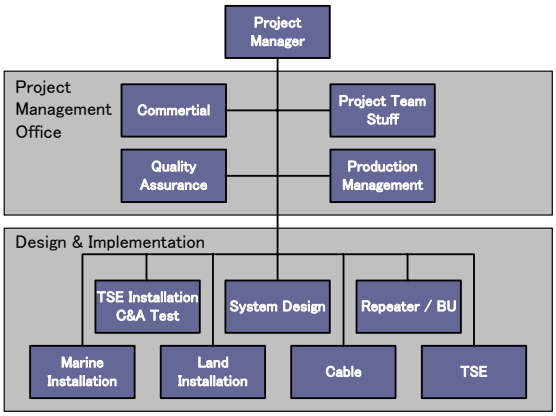

Figure 1: Basic Organization of Project Team for Submarine Cable System Construction

The project team consists of Project Manager, Project Management Office groups and Design & Implementation groups for submarine cable system construction.

The Project Manager is responsible for the entire project and shall maximize the capabilities of the project team toward the goal of the submarine cable system construction. The Project Manager determines the requirement and aim (goal) of the project, target and scope of the project team, then determines the project team organization and its members. The Project Manager shall clearly introduce to the team members the aim, target, and scope of the project, and shall empower the team members how their core competences will drive the project to be successfully completed. According to the concepts, the project team determines detail scope and design schedule, cost and quality plan for all necessary activities necessary for the system implementation.

The Project Management Office is in charge of the project implementation and is an official contact point for the system owners. The Office is responsible for any information given to the owners under the contract or agreement. All official documents and information is sent to the Project Management Office.

The Project Management Office consists of four groups such as Commercial, Project Team Stuff, Quality Assurance and Production Management, and supports the Project Manager and all groups for the Design & Implementation work.

The Commercial Group is responsible for all contractual, billing and financial coordination. The persons, who have been working on the commercial aspects from the contract negotiation stage, shall be generally assigned as group members.

The Project Team Stuff supports the Project Manager and the operation of the entire project team. The Project Manager and the Team Stuff manage the scope, time (schedule) and cost which are the three key factors to measure and control the project status, and also manage the resources and communication within the project team. They monitor the schedule and cost for the procurement, production, logistics and implementation, then distribute the project status and instructions to the team members, so that each member can perform its work efficiency and sequentially.

The scope management is the first key for the successful project management. The Project Manager and the Team Stuff shall determine detailed scope of work and its expected outputs, and then assign them to the groups in the project team.

The time management is the second key of the project management. The Project Manager and the Team Stuff shall design the plan of work (POW) for the entire system construction and distribute it to the team members. The time period for the determined scope of work shall be estimated and linked to the POW. The PDM (Precedence Diagramming Method) type of POW is generally used for submarine cable construction. The Team Stuff shall monitor the status of each scope and use the technique of CPM (Critical Path Management) for optimizing the lead and lag for each activity, and then update the plan of work, including the recovery plan and/or schedule changes.

The cost management is the third key of the project management. The Team Stuff

shall design the cost plan based on the scope management plan. The cost for each detailed scope shall be estimated and shall summarize the cost control tools, such as cost sheet or data base etc. The actual cost for each activity shall be monitored and put down to the control tools, which shows the status and progress of the project income and cost expenses. The Team Stuff shall give feedback on the cost status to the team members and alarm if the cost is likely beyond the project cost budget.

The Project Manager shall hold a meeting with the group leaders and the appropriate members to discuss the project status and the improvement/recovery plan of the scope, schedule and cost periodically and/or in appropriate timing during the project implementation.

The Quality Assurance Group is responsible for all quality aspects of the project team activities and its results for design, procurement, production, installation and testing for equipment and/or system. It shall design a project quality plan, which provides organization and process for quality control, at the initial stage of the project launch, then monitor and control the quality of the design, manufacturing, installation and testing works. It uses the tools and techniques for measuring the quality of the product and/or works, then feedback the results and gives instructions for improving the process of each activity for the system construction. Taking the appropriate balance between schedule, performance and cost is the key for controlling the quality of the entire project for the submarine cable system construction.

The Production Management Group is in charge of the overall management of the procurement and production of Submarine Cables, Repeaters and Terminal Station Equipment (TSE), etc. It draws up plans, including strategies how to realize the targeted cost and schedule, for the procurement of materials and/or devices, then design and control the resources at factory and/or their venders for the production.

In general the groups for Design & Implementation are determined, based on the responsible key products or key activities. The System Design Group is responsible for all system design, including the determination of specifications for the network, cable, repeater and TSE, so they can meet the requirements which is agreed with the system owners. There are technical groups, responsible for the design and control of key products, such as submarine cable, submersible repeater, TSE, which design the product to meet the requested specifications, provided by the system design group. As for the implementation groups, there are groups responsible for the land cable installation/testing, submarine cable installation/testing, TSE installation and C&A testing (C&A: Commissioning & Acceptance). Those implementation groups perform site/marine route surveys, design the installation materials, tools and the installation/test procedures based on the survey results with taking into account the performances and quality of the entire system, the installed cable and equipment.

This basic organization can be commonly adopted for submarine cable system construction projects, regardless to the scale of the constructed submarine cable systems, and to both if it is a new system construction or cable route expansion of existing system.

The construction of a submarine cable system requires an overall management of advanced DWDM transmission technologies and high-level submarine cable installation skills, as well as conformation with the regional regulations and timely achievement of the required permits. Therefore the Project Manager and the team are requested to hold large knowledge and vast experience, not only for project management skills, communicational skills and skills to establish close human relationship, but for technical aspects such as submarine cable

products, construction works, license & permit acquisition, etc.

3. PROJECT TEAM FOR CONSORTIUM PROJECT

In case of the construction of huge scale submarine cable systems, which is beyond the construction capacity of one system supplier, like the trans-oceanic cable system, the system construction is often performed by a Consortium of multiple suppliers. The structure of the Consortium can be divided mainly into two types. One type is the case when the scope of work for each Consortium company is divided by construction area (segment) basis (Case 1), and another one is the case when the scope of work is assigned based on activity basis (Case 2).

Figure 2 shows an example of the project organization for Case 1, when the scope of works is divided by segment basis, while Figure 3 shows an example of the project organization for Case 2.

In either case, the project teams, assigned by the Project Managers of the Consortium member companies, work together in a close partnership for leading the project to its goal.
Generally, one of the Consortium member companies is assigned as Consortium leader and manages the Project Management Committee for the whole system construction.

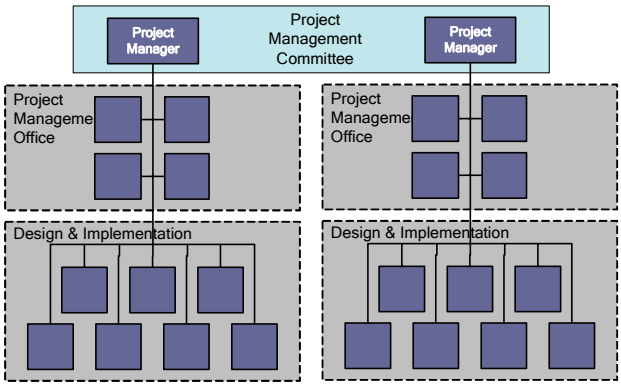

Figure 2: Project Organization for Consortium Project (Case 1)

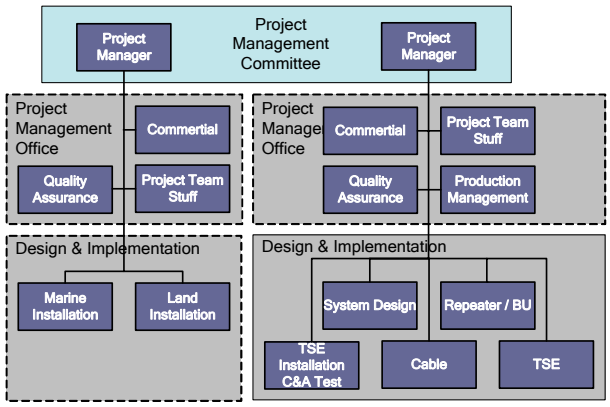

Figure 3: Project Organization for Consortium Project (Case 2)

In Case 1, each Consortium member company can proceed its part of production and installation in a parallel manner, which enables shortening of the construction time, especially for large scale systems.
In this case, since the construction of each system is performed individually by each Consortium member company, it is of great importance the integration of each part of the system to be deeply studied and designed before proceeding its manufacturing and construction. The system designers of each Consortium company shall work together for designing the total system performances and determining the interfaces between each part of the system.
In case that the scope of each Consortium member company is divided on segment basis, the relationship between the teams of

each member company does not affect to the project progress. On the other hand, in case that one segment is divided at the middle of the submarine plant and is shared by each Consortium company, the relationship between the teams of each company is significantly important. Most of all teams in each company shall frequently communicate with the partner company so that they can share the concept, design and partnership toward the goal of the project.
Such consortium structure best fits for the construction of large-scale submarine cable systems.

In Case 2, the Consortium is organized by companies, which can provide dedicated components and/or services such as cable, equipment and installation works. Each Consortium member company can configure a specialized team, focusing on the assigned part of scope of work. In this Consortium organization, in case if any of the member company is not capable to accomplish its part in timely manner, it might affect the related process and lead to delay of the whole system construction work. Therefore, at the initial stage of launching the project, the fully consideration and the preliminarily integration of the schedule and order of each scope of work of the member companies is of great importance, as well as providing adequate exchange of information on the design, manufacturing, construction and testing activities among each member .
Since the project team is organized by groups, which are assigned from each member company, the project management of the Consortium in Case 2 is much harder than those of the basic project organization. In this organization, the communication management is a key for the success of the project implementation. The Project Manager and the Team Stuff shall clearly determine the project team organization, including the communication route between the groups in the member companies. They shall gather the status of each work from each member company, and then exchange the information about the entire project status and give instructions in a timely manner to each other. Coordination meetings of the member companies shall be planed and held periodically, especially in advance to key project events, such as equipment shipping, cable loading and installation.

4. PROJECT TEAM ORGANIZTION FOR WAVELENGTH UPGRADE

The remarkable development of the WDM technologies makes it possible to expand the capacity of existing submarine cable systems by adding or upgrading the TSE (Terminal Station Equipment).
The wavelengths upgrade can be performed by some means, like the occupied design capacity can be expanded by replacing the TSE, or maximizing the system capacity by introducing TSE with the latest DWDM technologies into vacant wavelength bandwidths on the existing submarine cable system.

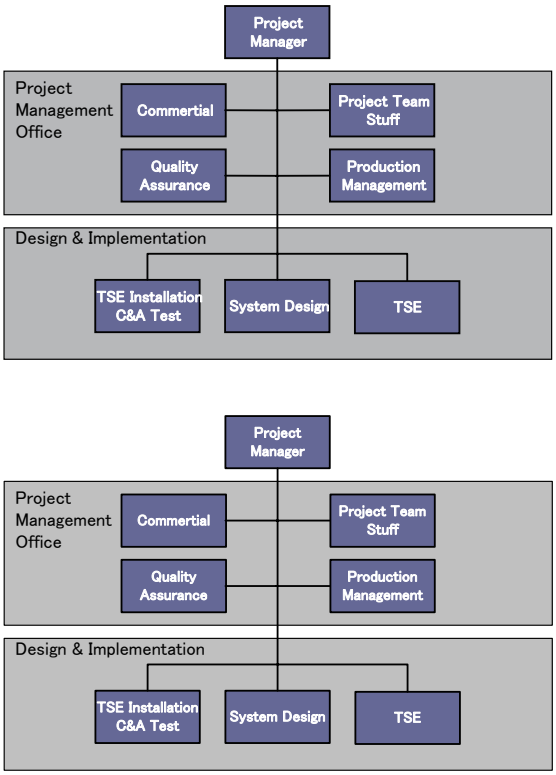

Figure 5**Figure 4**

Figure 4 shows an example of the project team organization for the wavelength upgrade project. Since the installation of the TSE and the testing of the system are the main activities for a wavelength upgrade project, the project team is considered to be organized with members, which are familiar with system design and/or Terminal Station Equipment. Therefore there are some cases when a group leader of a group from the Design & Implementation is assigned for Project Manager of the wavelength upgrade project.

The schedule of the wavelength upgrade project is shorter than those of the new system constructions, due to no submarine plant installation required, and to the competition of shorter delivery of the wavelength upgrade, which escalates every year. Since the schedule is determined by the TSE manufacturing period, transportation, installation and testing, the Project Team Stuff and the Production Group shall carefully study the order of scope in order to make a schedule for each activities and link them appropriately. The Production Group is strongly requested to minimize the production period of the TSE manufacturing for the wavelength upgrade project to achieve shorter delivery.

Since the uncertainty of transportation and custom clearance is one of the causes for delay of the wavelength upgrade project, the team is also requested to have skills and experience in logistics arrangements, including the license and type approval for the countries, where the station is located.

Minimizing the installation and testing period is also one of the keys for the short time system delivery. The TSE design group is requested to design the TSE to provide simple installation and adjustment free. There are some cases when the system owner already has their own specified test items, which were determined when the existing system was initially constructed. In such cases, the careful study of the meanings of each test item and the review of its test period can enhance the short time delivery of the wavelength upgrade for the existing systems.

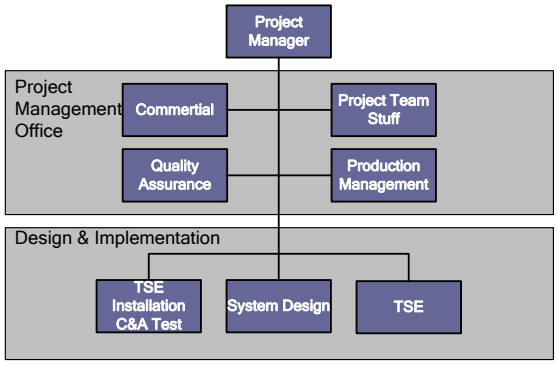

Figure 5: Project Organization for Wavelength Upgrade

5. CONCLUSION

According to the construction scale of the submarine cable systems and its type, if it is a new system construction or upgrade of existing system, the project team shall be organized with optimised structure and

appropriately assigned members, holding excellent abilities. The timely assignment of the project team, which appropriate for the project scale and characteristics, and its timely management is the key to the successful implementation of the project for the submarine cable system construction.

This paper has aimed on giving an overview of the basic structure of the project team and the role of every project group and member for the construction of the submarine cable systems. Furthermore the paper tried to summarize the structure and characteristics of the project teams involved in the Consortium and the wavelength upgrades.