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A STUDY OF PROJECT SCHEDULING AND CONTROLLING IN PROJECT MANAGEMENT IN THE OIL AND GAS INDUSTRY (EPCIC)

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ABSTRACT

A major concern in the oil and gas industry entails schedule control. Most projects slip past planned date due to certain reasons from either the client side or from the contractor side, this further causes an increment in cost of executing the project. The oil and gas industry in Nigeria consists of the upstream, downstream and midstream sectors while there are other companies – the oil and gas servicing companies – they are involved in the Engineering, Procurement, Construction, Installation, and/or Commissioning (EPCIC) of oil and gas facilities.

In this study, the oil and gas servicing companies in Nigeria are considered and studied based on experience of study population (being teams from oil and gas firms). The various functional departments of the EPCIC companies are studied and how various organizations gives roles to their project control and planning team. A survey was carried out considering three major oil and gas firms (Companies A, B and C). Responses were written and a total population of 15 persons was surveyed with total roles and responsibilities of forty-three gotten.

From this study, Project controllers from company A are responsible for all three (cost, schedule and scope); project controllers for company B are responsible for only cost management while company C are responsible for cost and schedule management. The project schedule as a very important tool to a project and project manager has been substantially studied from various sources. From this study, it is no doubt that the project schedule and control function is a very important one as major IOCs have taken it as a means to measure progress with key software.

INTRODUCTION

A schedule in project management is a list of a project's deliverables, activities, and milestones, often with projected start and end dates. These things are often assessed in terms of time, money, and resource allocation; they are connected by dependencies and planned occasions. The project management components of project planning and project portfolio management often employ project schedule. The terminal parts of the Work Breakdown Structure (WBS), the "statement of work," or a "contract data requirements list" may be closely connected to items on a timetable. A full-time scheduler or team of schedulers may be responsible for creating and maintaining the project schedule in numerous sectors, including engineering and construction, depending on the scale of the project. The planning of personnel may be one of the milestones, activities, and deliverables included on the project management schedule with anticipated start and completion dates. A resource schedule helps with the logistical planning for resource sharing across many organizations, while a production process schedule is utilized for the planning of the production or operation [1].
Project planning differs depending on the industrial discipline. In initiatives involving the building, banking, or oil and gas sectors, the expectations are completely different. There might be a wide range of needs, goals, and realizations even within one branch. For the construction of an office building, motorway, or metro, completely different strategies are envisaged. The fundamental traits of project management are evident everywhere, of course. Making accurate planning is further complicated by the various branches' unique characteristics [2].

BACKGROUND STUDY: PROJECT MANAGEMENT AND PROJECT SCHEDULE

According to PMI (2017), “a project is a temporary endeavor undertaken to create a unique product, service, or result”. Projects are started in order to provide deliverables that will help achieve goals. A result toward which effort is to be oriented, a strategic position to be accomplished, a goal to be accomplished, a goal to be acquired, a commodity to be created, or a business to be rendered are all examples of what are referred to as objectives. Any distinctive and verifiable product, result, or capacity to execute a service that must be generated to wrap up a procedure, stage, or project is referred to as a deliverable. Deliverables might be physical or abstract [3].

The practice of organizing, managing, and optimizing work and workflows in a manufacturing or production process is known as scheduling. Scheduling is used to distribute human resources, manufacturing processes, plant and equipment resources, and material purchases. Forward scheduling refers to the process of arranging work from the time resources become available in order to establish the shipment or deadline dates. Backward scheduling involves determining the start date and/or any necessary adjustments in capacity by planning the tasks from the due date or required-by date. As a fundamental time-management tool, a schedule or timetable comprises of a list of potential times for activities, events, or actions, or of a sequence of events that will occur in the order that they are meant to occur. The act of constructing a timetable, which includes choosing how to prioritize these activities and allocate resources among the many tasks that are conceivable, is known as scheduling. The person in charge of generating a certain schedule is often referred to as a scheduler. Creating and adhering to timetables is a long-standing human tradition [1].

There are several preparations to be done for progress management, including creating a reliable organizational structure and grading schedule, as well as making sure that cash, supplies, and other resources can be supplied on time. In order to execute the schedule on time and make suitable plans for the construction content in light of the scenario, it is also required to anticipate the weather conditions. executing the construction site management plan well, planning the layout of the site beforehand, and making adequate preparations for approaching heavy equipment. Additionally, it is important to arrange building supplies, small machines, lifting equipment, and other things in a prudent and safe manner [4]. Scheduling is the next step in the process, which starts with design, is followed by implementation, inspection, and control, and is affected when one of the connections makes a mistake that slows down the whole process. The creation of the timetable is the most crucial step in the whole process. A strong beginning, as they say, is half the fight won. In reality, however, it is construction units, construction units, and others who will always be flimsy, fail to take it seriously, and fail to understand that the progress of the implementation plan is the lifeblood of the plan, which results in the situation's implementation being ineffective. Each step of the progress planning process is interconnected, intimately related, and has an impact on the others [5].
According to Bokor, Koksis, and Szenik (2001), the earliest project scheduling tool was the Gannt chart, followed by other tools like the Cyclogram, and network analysis tools (like the Critical Path Method, CPM). They also noted that in the case of any project, how the resources are used is very crucial. As a result, particular attention must also be given to resource use in initiatives involving the construction sector. All project scheduling systems should take care of capacity management and task resource assignment to make it easier to locate the best solutions.

AIM AND OBJECTIVES

The major aim of this study is to have a dep look into the EPCIC company framework and how this architecture affects overall project completion. The objectives of the study include:

- Study various departments in the EPCIC companies
- Study the roles of project planners and controllers by surveying key oil and gas firms within the country.
- Study and determine the importance of proper project scheduling in EPCIC projects

LITERATURE REVIEW

Due to poor project management and control system, many projects are over planned, over budgeted, and fail to satisfy the consumers. This made it necessary to find solutions for improved customer engagement and effective communication. The fundamental goal of a project in the oil and gas business is to complete the scope of work within budget and on schedule without compromising quality (and if possible, exceed client's expectations on quality) in order to satisfy the clients. Before starting a project, it is crucial to have a solid strategy in order to attain this goal. This plan has to include every activity that needs to be done, the related expenditures, and an estimate of how long it will take to finish the project. Without such a strategy, the whole project scope would not be completed on time, under budget, or perhaps at all. As in other businesses, the oil and gas sector rely on effective project planning, strong teamwork, and open lines of communication with clients to avoid any unexpected hiccups. Effective telephone or email communication, regularly planned meetings or progress reports are just a few examples of communication channels that should be used in the workplace [6].

For the successful and timely completion of any project in the oil and gas industry, the work of a project manager and Project Management Team (PMT) cannot be overemphasized. The PMT includes personnel:

- Project Manager
- Project Engineer
- Project Planner and Controller
- Document controller

The PMT works together with the engineering team ensuring project progress is measures properly from inception to project close-out. After several studies of the oil and gas industry through interviews with professionals in the oil and gas sector, the following are breakdown of activities within the oil and gas servicing industries short formed as EPCIC, this forms the major WBS within the industry and therefore serves as the fundamental for planning [7]:

A. **Engineering:** The engineering phase in the oil and gas servicing industry is basically grouped into two:

- Front-end engineering design (FEED): After an Underlying theoretical Architecture or Feasibility Analysis has been completed, Basic Engineering, often known as FEED (Front End Engineering Design), is carried out. Various studies are being conducted at this time to identify technical problems and provide preliminary investment cost estimates prior to the commencement of the EPC (Engineering, Procurement and Construction) process. Typically, this work is awarded as an optional contract or via a competitive bid process to EPCIC contractors. The "FEED Package," which consists of several files and is the end result of the activity, will serve as the foundation for the EPC Contract bids. In order to prevent major change during the EPC Phase, it is crucial to accurately portray the client's objectives and the project's unique needs in the FEED Package. It is customary for clients to station themselves at the contractor's office while the job is being done since close contact with them is necessary.
- Detailed Engineering Design (DED): Detailed Engineering and design tasks are carried out via collaboration and cooperation between the project engineers and specialized discipline engineers who oversee the entire EPC operations. Building designs, piping designs, electrical designs, control designs, and other space-integration designs are all carried out concurrently on the basis of the Basic Design Package (FEED) and beginning with process design. It's crucial that the engineers keep in close contact. Early in the engineering and design process, EPCIC companies pays great attention to firmly incorporating plant operability and maintainability criteria as well as environmental and safety standards. The natural surroundings of the building site, such as the geotechnical, geophysical, geological, and climatic characteristics, must also be taken into account.

  Based on the basic engineering or front-end engineering and design (FEED) package, detailed design and engineering is the development of all necessary construction documents and drawings up to the AFC (Approved for Construction) stage for the construction. It also includes detailed bill of materials (BOM) for the purchasing of bulk materials. After taking vendor information into account, the Detailed Design and Engineering produces all construction drawings in addition to verifying the design foundation.

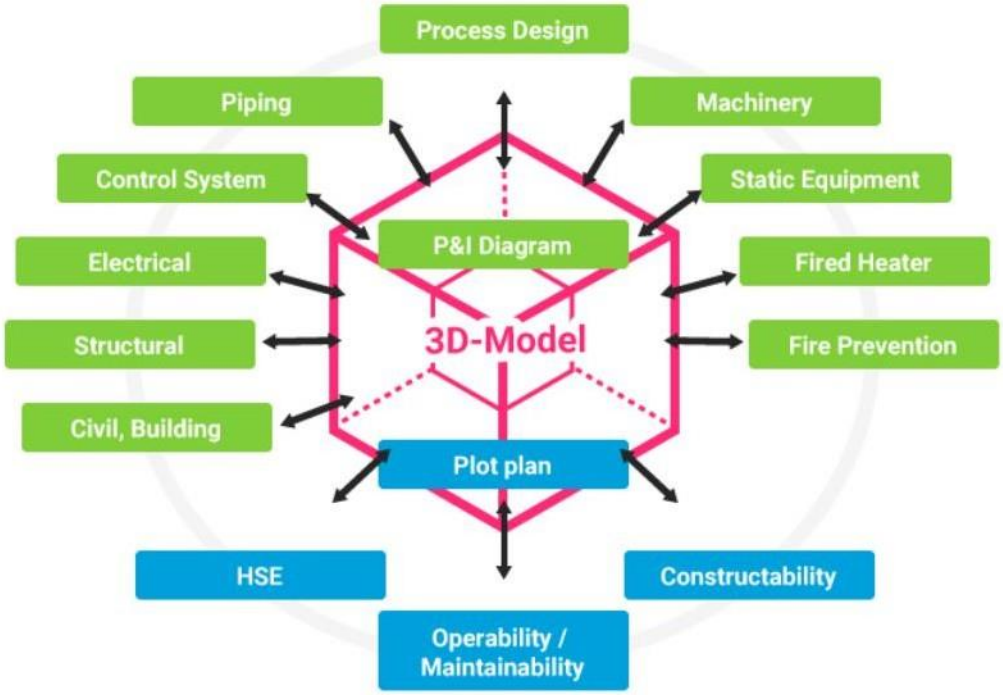

Figure 1: Basic Engineering Disciplines in Oil and Gas [7]

B. Procurement: Close to completion of the engineering phase, the procurement starts with building technical and commercial deliverables for vendors identification to procure long-lead items (LLIs). The LLIs are equipment or materials that takes more time to deliver and have impact on overall project delivery date. The duty of the procurement department is crucial. By closely collaborating on projects, the procurement department ties engineering and construction together. The primary duties of this department include obtaining supplies within the project's operating budget, monitoring the manufacturing process after an order is placed, and ensuring product quality via site visits and inspections in accordance with the project timeline. This unit requires employees with a variety of talents, including sensitivity to market trends, accuracy in comprehending international laws, calm judgment on pricing, stamina to bargain with suppliers, and strong resolve to adhere to stringent quality standards.
C. Construction: Surveying the location, reserving water, forming the land, and building the camp are the first steps in the construction of the plant to get it ready for full operation. Then come the various stages of construction, such as digging the foundation, building the above-ground structure, installing the plumbing and equipment, setting up the electric and instrument systems, painting, insulation, etc. A conventional mega project has over 1000 workers per day They make use of an enormous amount of construction equipment. Unexpected challenges arise at this point of the project's execution due to a variety of reasons including design, procurement, and others. But it would be able to overcome and transcend the challenges to completion with skill in planning and management, as well as teamwork and efforts. Although perseverance and patience are crucial at this point, everyone concerned may also participate in the immense delight of success.
D. Installation: This phase of service is not usually carried out by all oil and gas servicing industries. Some industries are basically into just EPC (engineering, procurement and construction). The installation phase is also critical to completion of a project in the oil and gas industry. It involves resources such as labor (personnel) and non-labor resources (equipment and materials).
E. Commissioning: At the end of every project, every installed equipment is tested using various API/ASME standards in testing. This phase is called the pre-commissioning. At completion of pre-commissioning, the facility is commissioned by approved bodies with the operations team and facility managers present.

Project Control and Planning

This is a major department in every project in the oil and gas industry. As found from various organization in Nigeria, the basic function of the project control and planning engineer is similar to that of a project manager but at a lower level of authority. The project planner/controller reports directly to the project/portfolio/program manager. Below are the functions of the project controller/planner according to Exxon Mobil criteria:

a. Work Breakdown Structure (WBS): The project scope of work is defined, planned, managed, and controlled using a work

breakdown structure (WBS), which is a hierarchical breakdown of the project's scope of work into manageable sections. A work breakdown structure, or WBS, is a task-oriented and thorough breakdown of activities by the code structure, including a key project deliverable (teamwork with scope parts), responsibility, time, and cost, which divides the whole project's scope of work into manageable pieces. (For instance, disciplines, units, systems, deliverables, etc.). The responsibility matrix for work activities (deliverables) is started by the Work Breakdown Structure (WBS), the team organization (resources) base responsibility matrix is started by the Organizational Breakdown Structure (OBS), and the costs allocated to the lowest level of the WBS are started by the resource-based Cost Breakdown Structure (CBS).

b. Cost Breakdown Structure (CBS): The lowest level of the Work Breakdown Structure's cost allocation is called the Cost Breakdown Structure (CBS) (WBS). A CBS is a breakdown of all work or services performed by contractors or subcontractors, as well as the price associated with the different structural components. A CBS that is incorporated into the cost management system is used to regularly compare the actual cost with the budget.
c. Organization Breakdown Structures (OBS): Organization Breakdown Structure (OBS) is a hierarchical system for organizing the resources needed to complete a task or project. To identify and organize the resources and organizational responsibilities with regard to carrying out project-related tasks, an OBS is a breakdown of all human and material resources.

Within the overall scope of work, a Work Package (WP) is a collection of linked things that is a logical subdivision of control accounts and a measurable and controlled element of the system. A WP is a straightforward job, activity, collection of works, or the whole project that is created using the Work Breakdown Structure (WBS). A WP is referred to be the lowest level of planning, measuring progress, calculating earned values, and differentiating from others. It is assigned a budget and a restricted length, as well as a goal start and completion date.

Positions and duties for a project or company are clarified using a Responsibility Assignment Matrix (RAM), which is the involvement of several roles in an organization to execute tasks: What will they do? A RAM is a diagram that depicts the connection between the contract's Work Breakdown Structure (WBS) components and the organizations charged with guaranteeing their fulfilment (OBS). (Responsible, Accountable, Consulted, and Informed) is another name for this concept. The Role and Responsibility (R&R) matrix chart identifies the linkages between the contract Work Breakdown Structure (WBS) parts and the designated accountable people in the organization, ensuring that the achievement is made in order to produce a successful product, service, or project.

Activity Description	Roles					
	Sponsor	Project Authority	Project Manager	Team Member 1	Team Member 2	Team Member 3
1	A	I	I	R	I	R
2	I	A	R	I	R	I
3		C	A	I	R	I
4	A	I	I	R	I	R

R: Responsible, A: Accountable, C: Consulted, I: Informed

Figure 2: Responsibility Assignment Matrix [8]

Project Scheduling

a. Project Schedule: A schedule is a time management tool that lists tasks, occasions, or actions for a whole period of time along with a scale and activity sequences. The Schedule is a list of the things that need to be done, with projected times or dates based on other data like resources, finances, how long things take, how dependencies are linked, etc. A project schedule is a tool for controlling time, costs, and resources. It lists all of the project's activities along with their start and finish dates, associated budgets, needed resources, and relationships with dependents. The project schedule serves as a tool to aid project management in attaining project objectives via effective use of available resources. It is a plan for project completion, a list of planned tasks to be completed within the allotted time period, often with anticipated start and finish dates.
b. Project control: Control is a system that is used as a regular practice to direct, examine, confirm, or audit the performance of activities or behavior. Project controls are a set of activities that include gathering data, analyzing the status, comparing actual performance to planned, communicating with project teams, and developing plans, measuring actual performances, and creating reports for the project schedule, cost, and resources to support sound and efficient decision-making. The capacity to predict, create corrective action plans, and move forward with the change management process all need the project controls.
c. Schedule Control and Management: This is a work process that ensures the effective operation of the project resources to meet the project target date. It includes developing various schedules, monitoring progress, analyzing and generating reports,

supporting troubleshooting, forecasting completion dates, etc.

d. Scheduling: This is the process of creating a timetable by evaluating the beginning and ending plans' activities as well as each one's length, predecessor and successor tasks, activity linkages, needed resources, and anticipated completion date. The important factors are often the cost and resource availability.

A Milestone Schedule, Bar Chart or Gantt Chart, PERT (Program Evaluation Review Technique), Network or CPM (Critical Path Method), and Detailed Report Schedule are examples of schedule types used in development techniques. These schedule types include document issue schedules (deliverables), material delivery schedules, construction heavy equipment mobilization schedules, etc. Project Master Schedule (Level 1), Project Summary Schedule (Level 2), Control Level Schedule (Level 3), Detailed Network Schedule (Level 4), and Reports Schedule (Level 4) are the different levels of schedules (Level 5). The Control Level Schedule is a project baseline document, while the Master or Project Summary Schedule is one of the contract papers.

- Critical Path Method (CPM): This is a well-liked network schedule management and control tool, displays activity sequences (predecessor and successor) and relationships (finish to start, finish to finish, start to start, finish to start) of all activities. The crucial route is the longest path that results from finished works or activities. A CPM is a supporting tool for determining the optimum strategy to execute the project while taking into account all relevant elements, such as resource mobilization. Morgan R. Walker of DuPont and James E. Kelley, Jr. of Remington Rand created a CPM in the late 1950s. The Primavera software is a frequently used CPM scheduling tool.
- Gantt Chart: This is a tool for managing and controlling schedules, which displays bar charts with activities and a time scale. A network analysis method used in project management called Graphical Evaluation and Review Technique (GERT) enables probabilistic treatment of both network logic and activity time prediction. The strategy for poorly specified, highly probabilistic R&D projects, where there may be several possible pathways and loops, is described most often and simply by a GERT.
- The current, past, and future time periods are shown on one window in the look-ahead schedule, also known as the window schedule. A monthly Look Ahead Schedule has a duration of 3 months and a weekly Look Ahead Schedule has a duration of 3 weeks.
- Network Schedule (Scheduling) is a way of scheduling work processes where numerous linked events are programmed into a sequential network based on beginning and completing dates. It is a graphical representation of the logical sequence of operations. The project critical route is shown in the Network Schedule (sequential activities have zero float). The CPM (Critical Path Method) Schedule is another name for it.
- Program Evaluation Review Technique (PERT): This is one of the strategies for managing and controlling schedules used in the planning and evaluation of large projects. In terms of pessimistic, optimistic, and best guess predictions, a PERT displays graphical relationships between activities, the time scale of each activity, and the needed overall length of the project.
- Resource loaded schedule: This refers to a project schedule that includes the allocation of resources (such as staff, labor, costs, equipment, and materials, etc.) that are required to complete the activities and project in accordance with the schedule. This schedule explains how project resources are supposed to be consumed throughout the scheduled project duration and assesses whether the allocation rules appear to be effective to ensure appropriate resource allocation. A proportion of a project's resources is often allocated to the Resource Loaded Schedule, which is then changed for each resource's individual assignment and given additional project percentages until the resources are 100%.

e. Schedule Level

- The master schedule, also known as a level one schedule, management level schedule, major milestone schedule, or top management report schedule, is the most basic type of project schedule. It uses a bar chart or Gantt chart technique to highlight key project activities and milestones on the entire project calendar.
- Project Summary Schedule (or Level 2 Schedule) is a top-level collaborative schedule for the whole timeframe that summarizes to the management summary schedule (Master Schedule) for high level internal and external management reporting (Level 1 Schedule). The project summary schedule displays the engineering, procurement, construction, and start-up milestones according to network logic, identifies the critical path, and lists the key deliverables broken down by units and system facilities. It also lists the project's most important activities, units, and systems. Typically, the Level 3 Project Schedule is summarized to create the Project Summary Schedule (Project Control Schedule).

  A real project schedule control and management tool for a work level is the Control Level Schedule (also known as Level 3 Schedule or Network Schedule). The Critical Path Method (CPM), a network scheduling technology, is used to integrate detailed EPC activities for the entire project scope of work into the Project Control Level Schedule. This schedule includes detailed input for all significant milestones, significant design and engineering, procurement, construction, pre-commissioning, and commissioning activities.
- The Project Control Level Schedule displays specific information about individual tasks as well as well-defined works by responsibility or discipline. This is the initial level of a comprehensive schedule that may be used as the foundation for a look ahead or window schedule for the control and management of the project schedule, allowing for significant critical path monitoring and management of the total project activity.
- The Critical Path Method (CPM) management plan, also known as Level 4 Schedule, Execution Schedule, or Construction Thorough Schedule, is a detailed and discipline-wide working level network schedule that lists every specific task that the project team is expected to complete. The Project Control Level (Level 3) Schedule may be developed into the Detailed

Network Schedule. A construction subcontractor may sometimes create the Detailed Network Schedule based on the Project Control Level (Level 3) Schedule.

- The Detailed Report Schedule (Level 5 Schedule), which covers detailed activities with work steps and dates (planned, forecast, and actual date), is typically used for project documentation (plans, procedures, and reports, etc.), engineering deliverables, procurement items, and election status for construction equipment, among other things.

f. Measurement of Progress: Progress is defined as a move in the right direction that represents a value or achievement. A value is discovered or established via the process of measurement.

Progress measurement is a frequent assessment of performance or accomplishment that provides accurate information on the potency and efficacy of programs. The weight value (or weight factor) is used by the Progress Measurement System (PMS) for the project stages and disciplines. Depending on the project's cost, schedule, resource, or integration of cost, schedule, and resource factors such work volume, activity durations, projected cost, resource effort hours (including labor hours), and so on, the progress may be measured in a variety of ways. For effective progress measurement, a number of elements must be taken into consideration, including the measuring method, the correctness of the input data, the frequency of collection and recording, change management, etc.

METHODOLOGY

In this research, an empirical study is carried out using three oil and gas companies as case study. Information gathered are from definition of roles from various personnel in the organization, website description for job vacancies and other reliable sources such as organization's website are used.

Project services personnel like the project managers, project planners, and project controllers were the target population for the survey. A simple questionnaire was sent to them via LinkedIn for the survey; the content of the questionnaire engaged the personnel to write a breakdown of their work role as defined by their respective organizations. The total estimated time for this was fifteen minutes.

RESULTS AND DISCUSSION

From critical study of various functionalities within the EPCIC companies and after survey of three influential oil and gas companies (Companies A, B and C), the table 2 below shows the result of various responsibilities of a project planner / controller according to the selected companies. Table 1 summarizes the total population captured for this study.

Table 1: Summary table for surveyed population

Companies	Count	Total count of roles & responsibilities
A	5	23
B	5	8
C	5	11
Total	**15**	**42**

Company A was able to give a total count of twenty-three various roles and responsibilities. These roles were well detailed and showed that project scheduling and controlling can be a very tedious task which also revolves round the three triangles of project management (cost, scope and schedule). The company has 55% contribution to this survey and their responses entailed a mix of both schedule, cost and scope management.

Company B was able to come out with a total of eight responsibilities as defined by the organization. They showed more responsibilities in the area of cost management. They mentioned various inputs of project controllers to project management. They have a 19% contribution factor in this survey.

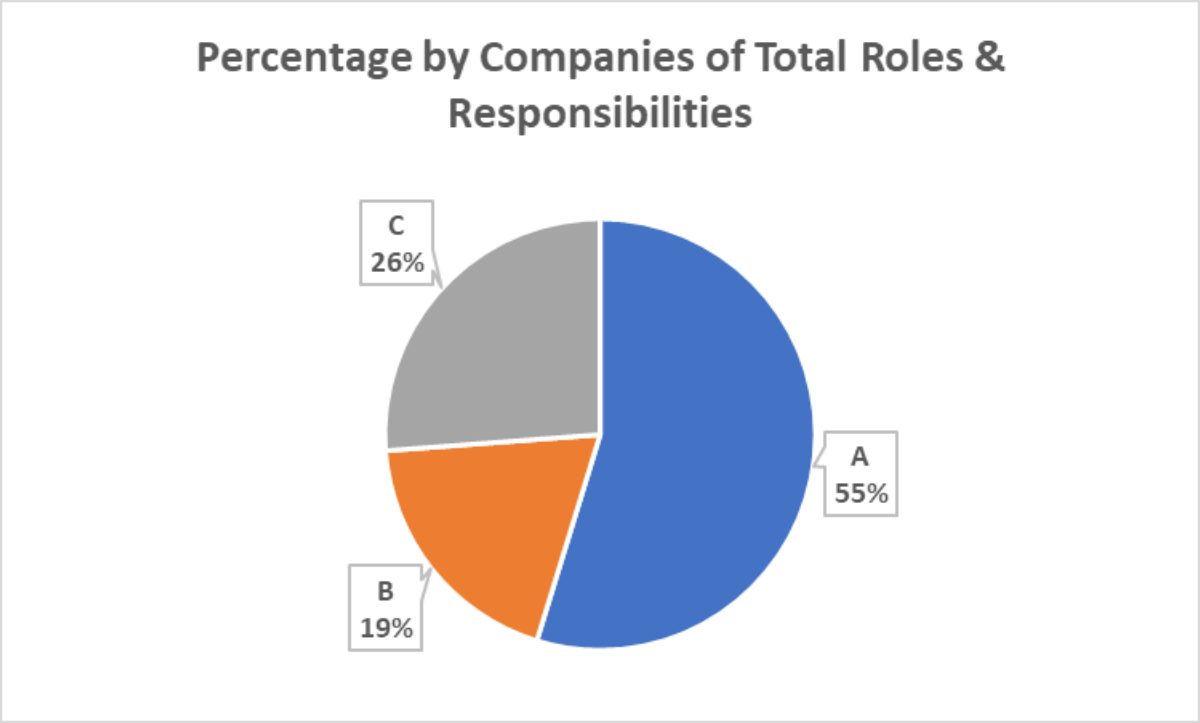

Figure 3: Chart of Survey

Table 1: Information Gathered from study

Company A	**Company B**	**Company C**
Provide overall project cost, schedule, estimating, progress measurement, and change management leadership and expertise.	Provide input for Investment Proposals, ensure that budget is released and ensure liquidity throughout all phases	Develop and maintain detailed plans for all phases of the offshore wind project, progressively incorporating contracted service providers planning into the overall project plans.
Manage Project Cost and Schedule throughout the project life cycle	Delivery of credible project forecasts is close cooperation with project teams. Reporting of project forecast on a monthly basis (minimum), on a weekly basis for Turn Arounds	Ensuring that all programmes adhere to contractual requirements.
Fully understand the scope of the project, contractual requirements, identify the major milestones and set clear priorities for the project team	Earned Value / Value of Work Done is to be reported on a monthly basis in line with finance reporting requirements (OPEX, CAPEX)	Fully monitoring project programmes from consent stage straight through to handover to operations, identifying key project milestones and highlighting critical path activities.
Lead the cost and schedule estimates for various Gate reviews and participate in the preparation of Gate packages	Provide guidance for cost sharing between different budget holders	Creating tender stage and contract programmes from client specifications.
Mentor junior project controls engineers and ensure the technical quality and timeliness of work	Financial closure of projects, including Final Cost Settlement reports for main contractors and filing within standards	Liaising with project team, sub-contractors and suppliers, specifically closely monitoring contractor schedules and reports; Identifying and analysing potential delays and proposing corrective / mitigation actions.
Serve as a link to the Project Services Common Skill Centre organization; gain alignment for support and approval of key deliverables (i.e., Estimates Development Plans, Estimates, etc.)	Delivery performance indicators (KPIs) in line with standards	Producing planning reports for input into the monthly reporting process and any other specific reports to support the overall project management and controls.
Develop and maintain the Project Controls related plans and procedures	Perform ad hoc problem solving and analytical requests from internal and external stakeholders	Identifying and implementing project planning processes and procedures, including producing periodic reporting on planning developments and overall project progress.
Ensure implementation of the stewardship process identify and champion process improvements	Strong prioritization skills, flexibility and client centred focus are essential. It is expected to simultaneously manage different projects and cooperate with different teams	Maintaining programme information to enable accurate records of contract history to be accessed.
Participate in kick-offs and ongoing meetings with the Engineering, Procurement and Construction (EPC)		Responsible for overall coordination of the project planning systems/ tools, including onboarding and training of users.

contractor(s) to ensure common understanding of project controls requirements		
Participate in gathering and recording lessons learned for the project		Undertake schedule risk analysis, as part of periodic cost and schedule risk exercises.
Serve as the budget custodian, lead financial close-out of the project and participate in another project close-out activities		Maintain overview of allocated WBS for overall project, including updates as necessary and communication to necessary stakeholders.
Stewards Project cost/schedule with ongoing project analysis, reporting, forecasting, budgeting and Change Management		
Coordinate the collecting, analyzing, and reporting of project cost and schedule control information to ensure overall project status is assessed, potential problem areas are identified		
Analyze trends, prepare forecasts, opportunities and vulnerabilities		
Administer the project change control process and communicate implication of changes. Steward the overall Change Management process		
Monitoring and appraising the performance of the Contractor(s) in the areas of cost control, progress measurement and control		
Ensure that proper and effective project control measures are executed by the Contractor		
Review and endorse the plans and procedures developed by the contractor. Ensure implementation of the same.		
Review and endorse progress and cost/schedule baselines and forecast prepared by contractors		
Analyse cost/schedule and progress reports and trends developed by contractor		
Review cost bases of contractor's Change Proposals / Orders		

Assist in developing/reviewing cost corrective actions and recovery plans, and making sure needed actions/plans are implemented		
4. Develop cost and schedule estimates to support opportunity assessments, Project funding, Project reviews, and ad hoc requests.		

From the above results, it can be seen that top oil and gas companies (international oil and gas companies, IOCs) have specified various responsibilities / roles of project controllers / planners; this shows the criticality of project planning in every project. Exxon Mobil gave more responsibility to them as they are key in supporting any project. Major tools required that have been identified by IOCs are:

- Microsoft suites especially Excel
- Primavera P6 or MS Project for scheduling, cost management and resource planning and progress measurement.
- SAP

Due to the current increment in analytical data being derived from projects, project planners/controllers have expanded to require data analytics tools for proper presentation and progress reporting.

The following tools are required:

- Tableau
- Power Bi
- Power Query

Conclusion and Recommendation

The roles and responsibilities of project planners and controllers in executing a project within an agile project management cannot be overemphasized. The discipline tends to help the project managers give better progress reporting by reducing the workloads on the project managers. The conclusion that it takes combined effort of the project management team (especially the project planner/controller with the project manager) are the factors that determine project success is the best one to draw from their real-time monitoring of project timelines, resources, budgets, and associated assets. Team members involved in the project may access and change the project schedule, keeping everyone up to speed on the state of the project as a whole. Project managers must expedite certain tasks at extra cost during project scheduling in order to shorten the project's timeline. The time and cost of each activity for the whole network will be decided differently, and the resulting set of choices will help to achieve the desired time, cost, and realization of the time cost trade off issue. The trade-off between time and money presents project planners with both difficulties and possibilities to come up with the best plan that best balances the two in order to execute a project on time and on budget, which is of great economic significance.

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