

Running Head: OIL AND GAS

**MAC (Main Automation Contractor) Is an Innovative Way to Reduce Risk in
Automation Projects: Oil and Gas Sector**

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Introduction

Background

Main Automation Contractors (MACs) oversee projects and deliver necessary resources (such as personnel, management, and materials). Also, it handles the exchange of information between parties and offers interface management for the engineering providers to guarantee uniform supply (Zhao, et al., 2019). Front-end engineering and design (FEED) research and concept design may help simplify process requirements and arrive at workable, optimum solutions. Oil and gas companies, facing an uncertain future, must manage expenses, maximise returns on existing assets, and keep production going. In order to accomplish these goals, automation and smart technologies are necessary tools. In the modern, digital age, automation has emerged as a crucial factor in the oil and gas sector (Ghobadi, 2018). The availability of a plant can be increased through the use of digitalization, automation, and the deployment of smart technologies, which make data about the plant and its equipment readily available to the engineering, operation, and maintenance staff. This allows for more efficient problem solving, leading to higher plant performance. The capacity to access this data quickly and from wherever it supports needed is a key factor in achieving operational excellence and making quick decisions (El and Almentheri, 2020).

Implementing the notion of a "Digital Oil Field" paves the way for efficient plant management to be conducted from afar. It supports for full Health, Safety, and Environment (HSE) compliance while limiting workers' exposure to risk (Mendoza, et al., 2021). To guarantee plant availability with minimal output loss, automation delivers a "single window" operation for effective management of plant operation and supports predictive / preventative maintenance (Wu, et al., 2022). Implementing automation and smart technologies and reaping their advantages is not without difficulty. It encounter difficulties at every stage of deployment,

including technology selection, infrastructure construction, a dearth of trained personnel to operate the new technologies, a proliferation of system interfaces, an overabundance of data, an avalanche of false alarms, a lack of cyber compliance, etc. Each challenge must be transformed into a chance to get the maximum advantages of "automation and smart technology" (Ghobadi, 2018).

The manufacturing sector has, over the last decade or so, been on the lookout for more efficient and less expensive projects of getting work done (ZEMRANE, et al., 2019). A more modular method, incorporating multiple skids from multiple suppliers, has replaced the conventional stick-build design strategy for new projects. Modular design, modular skid design, and package construction are all terms used to describe this new approach to product development. The new approach has the advantage of being adaptable and scalable, and it also shortens the time it takes to finish a project. However, it also presents significant integration and project management issues (Davila, et al., 2020). Due to the complexity of major projects that may include as many as fifty separate skid builders, it is essential to find a MAC that is familiar with the industry and can facilitate a smooth transition between the many service companies (Antwi, et al., 2018).

Due to rising energy needs throughout the world, power plants must focus on providing reliable service in the areas of project management, plant operations, and preventative maintenance (Geraldo, et al., 2019). However, companies are increasingly hampered by staffing concerns, financial limitations, and tighter deadlines. Companies must contend with both the grassroots construction activity in developing economies and the challenge of executing multiple projects concurrently across different areas (Harbud, 2022). With our Innovative MAC Services (yi-MAC) approach to project execution, Yokogawa is increasingly relied upon by companies to operate as the project's principal automation contractor, taking charge of all automation-related tasks. In order to develop, supply/procure, and manage instrumentation, control systems, safety instrumented

systems, and related interfaces for all project components and facilities, Yokogawa delivers highly skilled and well-resourced control systems professionals.

Problem Statement

In the past few years, it is showed that there are huge delays comes in the Automation Projects in Oil and Gas Sector (El and Almentheri, 2020). Multiple reasons has been comes out in the delay of the projects. Most of the oil and gas firms across all over the globe faced numerous problems and comes in a great loss. Most business owners used many methods for the purpose to reduce risks and delays in the automation projects but could not achieve success in a professional manner. MAC (Main Automation Contractor) can be considered as the most useful and effective way to overcome on this issue as compared to the other methods in oil and gas sector.

Research Aim

The core aim of the research is to explain the significance of the MAC (Main Automation Contractor) for the purpose to reduce the risks in the Automation projects in Oil and Gas Sector.

Research Objectives

Following are the main objectives which will be very useful for the researchers to accomplish the goals of the research in an effective manner:

- To determine the problems arises in the delaying of Automation Projects.
- To understand the importance of MAC (Main Automation Contractor).
- To describe the significance of the Automation projects to the owners of Oil and Gas firms.

Research Questions

Below questions will be considered as the most crucial questions for the researchers to achieve the aim of the research:

- What are the core reasons of delaying in the automation projects?
- What are the difficulties faced by the business owners during the Automation projects?
- What is the most reliable and effective way to reduce the risks in Automation Projects?

Literature Review

Reasons to Use MAC in Oil and Gas Sector

The services of a MAC include project management and the provision of a diversified array of resources (such as specialists, tools, and infrastructure). Also, it handles the transfer of information between parties and offers interface management for the engineering providers to guarantee supply consistency (Palaniyappan, 2019). In order to rationalise process requirements with feasible, optimum solutions, preliminary concept design and FEED studies might be conducted. There are several motivations for oil and gas companies to deploy MAC initiatives.

The growing importance of technology: Oil and gas firms, in order to maintain flexibility in the increasingly complicated energy market, must automate crucial operations such as gathering operational data, regulating important infrastructure processes, and analysing information for business insight (Saba, et al., 2021). Instead of depending on several geographically dispersed specialists, an effective option is to collaborate with a central automation professional who can combine the various programmes needed for precise and dependable automation.

- Margin declines as a result of increased competition and shifting market conditions. All stakeholders have an interest in seeing operators save expenses (Möllers, 2020).
- Reliable skills and knowledge are required, yet it might be costly to hire professionals to work in-house. Employees who retire take specific, first-hand knowledge of the staff's processes and procedures with them (Geraldo, et al., 2019).

- The MAC's hands-on knowledge allows them to tailor a solution to the specific requirements of each automated system's end user.

Advantages of the MAC Approach

Time and money saved may be seen by including the automation contractor early in the project's execution, as suggested by Frost & Sullivan (Möllers, 2021). The time an end user spends liaising with several EPC contractors and software providers is drastically reduced in MAC-managed projects. By eliminating unnecessary costs, companies may save money on change orders, misunderstandings, and miscommunications (Gajewski, et al., 2019). Because the end user is in charge of the solution, the automation provider is strongly driven to adhere to the end user's specifications and preferences. Partner MAC checks that the client's FEED-described vision is reflected in the automation system (front-end engineering and design).

The MAC inspects all infrastructure to check for code violations, certifications, and guidelines violations, and to reduce integration issues (El and Almentheri, 2020). Ultimate operational and financial success is achieved when the end user and the skilled MAC partner work together to design an infrastructure that can grow with the company. Reduced implementation costs, quicker commissioning, and easier modification to suit future needs all contribute to the MAC project's high return on investment (Harbud, 2022).

MAC Best Practices

The MAC, in contrast to the current automation market where major companies commoditize SCADA products, takes the 'big picture' view, encompassing all phases of implementation and aiming for a complete monitoring and control solution that benefits oil and gas companies from the field to the boardroom.

MAC value chain: The MAC is responsible for managing the whole life cycle of an automated control infrastructure, from initial planning and design through system procurement, FAT, SAT, start-up, and maintenance (Davila, et al., 2020). A MAC acts as a client's advocate, making ensuring each stage of development is primed to go on to the next and contributing to the project's value at every stage.

Enterprise-wide utilization: Instead of focusing on only one project at a time, the MAC visualises a holistic solution of the infrastructure and how it may be adapted to meet future needs. See Figure 2 for an illustration of how an all-encompassing automation solution integrates field devices and RTUs with SCADA, data analysis and process control software, and sophisticated data management tools to benefit the business as a whole (Ghobadi, 2018). All of the programmes are supported by well-tested platforms, so companies can trust the information that is provide, and have all the built-in safeguards and redundancies to prevent data loss.

State-of-the-art security: In terms of security, the MAC will know what to expect when using control systems or apps from multiple vendors in the same setting. A tremendous value to the end user's project may be gained by combining MAC's expertise with vendor-specific standards to lessen cyber security risks (El and Almentheri, 2020).

MAC Services for Oil and Gas Industry

Customers are being pushed even further to expand MAC to value-added operations by a combination of a shrinking staff and rising project complexity (Ghobadi, 2018). Automation service suppliers may diversify their offerings and establish themselves as industry leaders by including technologies for data and risk management, asset and production optimization, and energy automation (MAIC). Competing and distinguishing in the MAC-driven global oil and gas industry, a new study by Frost & Sullivan, reveals that the market generated revenues of USD 6.2bn using the MAC strategy in 2014, and forecasts this to reach USD 9.37bn in 2021, a compound annual growth rate of 6.1 percent (Wu, et al., 2022).

Automation vendors' goals of building life-cycle partnerships with oil and gas companies tend to favour the implementation of MAC-style projects. Furthermore, automation suppliers with MAC approaches are the only ones capable of understanding and acting upon the complex needs of end-users to boost productivity, enhance energy efficiency, guarantee seamless operator interfaces, manage alarm overload, and automatically consolidate operational data for business decisions (ZEMRANE, et al., 2019). Despite the fact that automation vendors are transitioning from "problem-solving" solution providers to "one-stop shop and long-term value-creating" strategic partners, a void remains in the market due to their lack of daring acquisitions in the disruptive technology field. It is possible that information technology based companies may take market share away from industrial automation companies due to the lack of specialty technologies that complement MAC services (Zhao, et al., 2019).

MAC service providers may improve their value delivery by adopting a project execution approach centred on synergized alliance with clients, system integrators, and engineering, procurement, and construction companies (Ma, et al., 2018). In addition to facilitating collaboration with national oil companies,

providing managed services is a necessary first way. To deliver integrated managed services that span an asset's full lifespan, vendors that specialise in automation must first create the ability to gather, integrate, display, and control information, and then construct a solid foundation on which to store and exchange this data (Davila, et al., 2020). This will allow MAC to unlock hitherto untapped Greenfield and brownfield prospects in the international oil and gas sector.

Methodology

Research Design

When planning a research, it's crucial to prioritise the design of appropriate strategies, techniques, and procedures. The primary goal of research design is to choose the most appropriate data gathering procedures. Research design is also useful for expanding one's understanding on a subject. When investigating a subject, researchers might use a wide research of research strategies. However, a secondary qualitative design may be the most useful design to take with the work at hand. The primary rationale for using this way is that it provides a reliable means of researcher's collection.

Research Approach

Researchers have a lot of leeway in choosing their research, however an inductive approach will be applied here. The goal of inductive methods is to allow conclusions to be drawn from underlying assumptions made in the original data. The inductive approach excels because it relies on conjectures about the future. In doing so, the researcher is able to have a better grasp of the status of the field and come up with hypotheses for further study. Researchers may undertake inductive studies to create reliable and applicable techniques.

Data Collection

For each subject, researchers will use a unique set of methods. Secondary qualitative study method will be used for this investigation. Consequently, the researcher will employ a wide variety of articles, books, and journals to compile data on MAC (Main Automation Contractor) Is an Innovative Way to Reduce Risk in Automation Projects: Oil and Gas Sector. The researcher will utilise a study of articles to help get credible and accurate data on this issue. In cases when the quality of the methods used is subpar, papers and reviews may

be relied upon as the most secondary and helpful resources available. The many papers will end up being very useful to the researcher in accomplishing the goals of the study.

Data Analysis

The analysis of data is the cornerstone and heart of this approach. This is so because the currently available data analysis methods have to be very trustworthy in their analysis. There are a plethora of data analysis methods that may be used to get high-quality results for every given research question. However, 'content analysis' will be used since it is the best method for analysing the data in this thesis. Content analysis is used because it is the easiest method for analysing large amounts of data. This method will prove to be very efficient and useful in evaluating content patterns for the research at hand. The ability to reread the texts of interest and the time invested in choosing high-quality results are two additional benefits of this method of analysis.

Ethical Consideration

Various ethical considerations should be taken into account by researchers before, during, and after the conduct of any study. Considerations in research refers to the ethical principles and values that should be taken into account while conducting any research (Mendoza, et al., 2021). All of the risks associated with confidentiality, choice, autonomy, and open dialogue are included in these values. Humans depend on secondary research, which requires participants' informed agreement when used in ethical research. It is concluded from this research that researchers have a lot of ethical considerations while conducting out their investigations. Avoiding plagiarism by citing a source verbatim is an important ethical consideration. The researchers' confidentiality to keep important information about the Oil and Gas Sector and the MAC method private is another important ethical consideration.

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