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Comparative Review and Analysis of Range of Mega and Complex Projects

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Executive Summary

This report analyzes the management of the Hinkley Point C project in the UK using five key principles of mega and complex project management. The paper emphasizes the value of transparent and cooperative stakeholder engagement, proactive risk management, the adoption of sustainable practices, the creation of efficient project governance structures, and the promotion of an innovative culture. The paper makes suggestions on how to manage the project more effectively, including expanded stakeholder involvement, improved risk management techniques, increased attention to sustainability, improved project governance, and ongoing innovation. These suggestions are meant to increase the project's value for money and guarantee its successful completion.

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Introduction

Due to their size, magnitude, and intricacy, colossal and intricate projects provide considerable difficulties for project managers and stakeholders. To guarantee that these projects are finished on schedule, within budget, and to the requisite quality standards, rigorous scheduling, organization, and implementation are necessary. The Hinkley Point C nuclear power station, which is being constructed in Somerset, England, is one such massive and intricate project. One of the largest building projects in Europe, this project entails the development of two nuclear reactors with an aggregate capacity of 3.2GW (Smyth, Lecoeuvre, and Vaesken, 2018). The Hinkley Point C project is a partnership between China General Nuclear Power Corporation (CGN) and EDF Energy, a division of the French energy corporation EDF. Given the project's exorbitant cost, possible adverse environmental effects, and worries over the participation of Chinese state-owned firms, it has drawn considerable attention and debate (Smyth, Lecoeuvre, and Vaesken, 2018). The oversight of the Hinkley Point C project will be looked at in this research, covering its governance model, innovation tactics, stakeholder management, supply chain management, and program management. The study will also assess the project's capacity for gaps, problems, and opportunities and offer suggestions for how to improve project management to get more bang for your buck.

Mega and Complex Principles/Themes

Multiple Stakeholders priorities and complexities

Stakeholder engagement is a critical principle in mega and complex projects. To guarantee that all important stakeholders' wants and concerns are taken into account, it entails

involving them all in the decision-making process. In the case of Hinkley Point C, a massive and intricate project involving the construction of a nuclear power facility in the UK, this principle is crucial (Daniel and Daniel, 2019). Nuclear power plants produce radioactive waste that is harmful to the environment and human health (Kaminsky and Zerjav, 2016). Making local businesses and residents a part of the project helps ensure that the community receives the most economic benefit possible from it. Integrating local companies and citizens in the initiative ensures that the neighborhood gains the maximum economic advantage from it.

Stakeholders Management Problems, Challenges and Issues in this Mega Project

One of the primary obstacles in stakeholder management involves guaranteeing that all stakeholders have a voice and their worries and demands are considered and taken into account. This requires effective communication and engagement strategies that involve stakeholders at different stages of the project lifecycle. Another opposition is managing stakeholder demands, especially in regards to the project's timeline, budget, and environmental impact (Kaminsky and Zerjav, 2016). In order to accomplish this, it is necessary to communicate in a clear and open manner about the project's aims and objectives as well as any potential dangers and advantages.

Moreover, handling stakeholders can be tough when there are clashing captivates and conflicting objectives. For example, environmental divides may be apprehensive about the initiative's implications on the local environment, while energy corporations may be concentrated on optimizing profitability (Smyth, Lecoeuvre and Vaesken, 2018). To address these challenges, it is important to adopt a collaborative and transparent approach to stakeholder management.

Priorities assessment when dealing with different level of complexities

In the case of the Hinkley Point C project, the priorities assessment is crucial due to its complex and multi-faceted nature. One of the top priorities in the Hinkley Point C project is stakeholder management. Engaging stakeholders in a transparent and collaborative manner is essential to ensure their concerns and needs are taken into account during the project's planning and implementation. The project involves significant technical, environmental, and financial risks, and therefore requires a proactive and systematic approach to risk management. Identifying, assessing, and managing risks throughout the project lifecycle is critical to ensure that the project is delivered on time, within budget, and to the required quality standards (Smyth, Lecoeuvre and Vaesken, 2018).

Sustainability is also a key priority in the Hinkley Point C project. Balancing economic, social, and environmental considerations is essential to ensure the project's long-term success and to mitigate its impact on the environment and society (Daniel and Daniel, 2019). Finally, effective project governance is crucial to ensure that the project is delivered on time, within budget, and to the required quality standards. Establishing clear roles, responsibilities, and decision-making structures, as well as a culture of innovation and continuous improvement, are

also important priorities to enhance the project's outcomes and value for money (Smyth, Lecoivre and Vaesken, 2018).

Priorities level vs Complexities level

When dealing with a mega project like Hinkley Point C, it is important to prioritize and manage complexities effectively to ensure project success.

| Priority Level | Complexity Level | Example |
|----------------|------------------|--|
| High | High | Developing a robust risk management plan that addresses technical, environmental, and financial risks associated with the project. |
| High | Medium | Engaging stakeholders effectively to ensure that their concerns and needs are taken into account during the project's planning and implementation. |
| Medium | High | Ensuring the project is completed within budget and on time while maintaining high-quality standards. |
| Medium | Medium | Implementing sustainable practices throughout the project lifecycle to minimize the project's environmental impact. |
| Low | High | Developing effective governance structures and decision-making processes to ensure the project's success. |
| Low | Medium | Encouraging a culture of innovation and continuous improvement to |

| | | |
|-----|-----|--|
| | | explore new ideas, technologies, and approaches that can improve project outcomes. |
| Low | Low | Managing day-to-day operational activities to ensure that the project is executed efficiently and effectively. |

To ensure project success, effective prioritization and management of high-priority/high-complexity items are crucial due to their significant impact. Nevertheless, medium-priority/medium-complexity tasks should not be disregarded as they can still affect the project's outcome significantly. Additionally, efficient management of low-priority/low-complexity items is necessary to prevent them from diverting attention from critical aspects of the project(Daniel and Daniel, 2019).

Project Management and Programme Management in Mega and Complex Projects

Hinkley Point C is an excellent illustration of a mega and intricate project where the roles of project management and program management are crucial in guaranteeing its triumph. The project encompasses numerous stakeholders, intricate technical necessities, and substantial financial investments. Effective project management and program management are necessary to ensure that the project is delivered on time, within budget, and to the required quality standards (Smyth, Lecoivre and Vaesken, 2018). Program management is also important to ensure that the project is aligned with broader organizational objectives and to coordinate multiple interdependent projects and activities. Hinkley Point C's project management and program management teams must work together closely to ensure the project's success.

Level of Complexities around this Mega Project

Managing the Hinkley Point C project involves dealing with a multitude of technical, environmental, social, and financial factors, making it highly complex. The ensuing are some of the primary complexities linked with the project:

| Complexity | Description |
|--------------------------|---|
| Technical Complexity | The project involves the construction of a new nuclear power station, which requires the integration of various complex technical systems and components, such as nuclear reactors, cooling systems, turbines, and generators. |
| Environmental Complexity | The project's location on the coast of the Bristol Channel poses significant environmental challenges, including the protection of local ecosystems, the management of nuclear waste, and the impact of sea level rise and coastal erosion. |
| Social Complexity | The project involves engaging and managing various stakeholders, including local communities, environmental groups, government agencies, and energy companies. |
| Financial Complexity | The project involves significant financial risks, including construction costs, regulatory requirements, and fluctuating energy prices. Managing these risks requires a detailed understanding of financial markets, project finance, and investment risk management. |

| | |
|---------------------------------|---|
| Legal and Regulatory Complexity | The project is subject to various legal and regulatory requirements, including environmental regulations, health and safety regulations, and nuclear regulatory requirements. |
|---------------------------------|---|

Gaps Analysis

Based on the complexities and priorities identified in the Hinkley Point C project, there are several potential issues, problems, and challenges that could arise. A gaps analysis can help to identify areas where the project may face difficulties and where improvements are needed (Smyth, Lecoivre and Vaesken, 2018). Some potential gaps in the Hinkley Point C project are:

| Potential Issues/Problems/Challenges | Explanation |
|--------------------------------------|---|
| Political and regulatory issues | The Hinkley Point C project faces political and regulatory issues, including concerns about nuclear safety, environmental impact, and the cost of the project. |
| Technical risks and challenges | The project involves new nuclear technology and advanced engineering techniques, which could pose technical risks and challenges. |
| Stakeholder engagement | The project involves a large number of stakeholders, including the local community, environmental groups, government agencies, and energy companies. Engaging these stakeholders in a transparent and collaborative manner is critical to ensure their concerns and needs |

| | |
|-------------------------|---|
| | are taken into account. |
| Supply chain management | The Hinkley Point C project involves a complex supply chain, with multiple vendors and contractors involved in the project. Managing this supply chain effectively is critical to ensure that materials, equipment, and services are delivered on time, within budget, and to the required quality standards. |
| Project governance | The project involves multiple stakeholders and requires effective governance to ensure that the project is delivered on time, within budget, and to the required quality standards. |

Project Management opportunities in this Mega Project

Professionals in project management have ample prospects to advance and apply their skills through the Hinkley Point C project, particularly in areas like stakeholder engagement, risk management, project governance, innovation, and sustainability. Several key opportunities are available, including:

- **Stakeholder engagement:** Effective stakeholder engagement is vital for the success of the project. Project management professionals can develop and implement stakeholder engagement strategies, facilitate communication with stakeholders, and manage their expectations.
- **Risk management -** The Hinkley Point C project involves significant risks, and project management professionals have the opportunity to develop and implement risk management strategies to mitigate or manage these risks.

- Project governance - The project involves multiple stakeholders, and effective project governance is crucial for ensuring project success. Project management professionals have the opportunity to establish clear roles, responsibilities, and decision-making structures and to manage project resources effectively.
- Innovation - The project involves the use of new nuclear technology and advanced engineering techniques, and project management professionals have the opportunity to encourage and facilitate innovation throughout the project lifecycle.
- Sustainability - The project aims to generate low-carbon electricity while reducing greenhouse gas emissions, and project management professionals have the opportunity to develop and implement sustainable practices to minimize the project's environmental impact.

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Programme Management opportunities in this Mega Project

The Hinkley Point C project offers various opportunities for program management. Firstly, the project is a significant undertaking that involves several sub-projects, necessitating a cohesive program management approach to ensure successful delivery (Thomas, 2016). Secondly, the project utilizes advanced technologies and techniques such as digital engineering and new nuclear technology. Program management can help ensure that these technologies are effectively integrated into the project and their benefits maximized (Nabawy and Khodeir, 2020). Thirdly, the project encompasses numerous stakeholders, including local communities, government agencies, and energy companies. Program management can ensure that these stakeholders are efficiently engaged throughout the project lifecycle, and their needs and concerns are considered in decision-making (Nabawy and Khodeir, 2020). Finally, the Hinkley Point C project provides an opportunity to improve and develop program management capabilities and knowledge in the nuclear energy sector. As one of Europe's largest infrastructure projects, successful program management can establish a precedent for future projects in the industry (Thomas, 2016).

Complexities in Phase-by-Phase Management

The success of a large and intricate project, such as Hinkley Point C, heavily relies on the principle of project governance. To achieve this, it is essential to have an efficient project governance framework in place, which guarantees the project is completed within the budget, schedule, and quality standards as expected (Glasson et al., 2021). This includes defining clear responsibilities, roles, and decision-making procedures to ensure all parties involved understand their obligations and work cohesively towards achieving the project's goals by completing the critical project phases as required.

Programme Management Life Cycle for the Mega Project

- I. Initiation Phase - The project was initiated by EDF Energy and the UK Government, with the aim of providing low-carbon electricity and creating economic benefits for the country.
- II. Planning Phase - This phase involved the development of a detailed project plan and the establishment of project governance structures.
- III. Execution Phase - This phase involved the construction and installation of the project components, including the two nuclear reactors, associated infrastructure, and electrical systems.
- IV. Monitoring and Control Phase - This phase involved the monitoring of project progress, identification of any issues or delays, and implementation of corrective actions.
- V. Closing Phase - This phase involved the decommissioning of the old power station, commissioning of the new plant, and handover of the project to the client.

Phase by phase

Extensive feasibility studies and assessments were conducted before the Hinkley Point C project was approved. The project followed a five-phase project management approach, starting with the initiation phase, where the need for the project was identified and its feasibility assessed. The planning phase followed, where the project's scope, budget, timeline, and resources were defined. Detailed engineering studies were carried out, and a comprehensive project plan was developed, which included the project schedule, budget, risk management plan, and procurement strategy.

The third phase was the execution phase, where the project plan was put into action, involving the construction of two EPR nuclear reactors, installation of necessary infrastructure, and commissioning of the plant. The fourth phase was the monitoring and controlling phase, where the project progress was monitored, and any deviations from the plan were addressed. The Hinkley Point C project implemented a robust project management system, providing real-time data on the project's progress, cost, and schedule.

The final phase was the closure phase, where the project was formally closed out, and its performance evaluated. For the Hinkley Point C project, the closure phase will include the decommissioning of the plant, requiring careful planning and execution to ensure safety and environmental responsibility.

Visuals

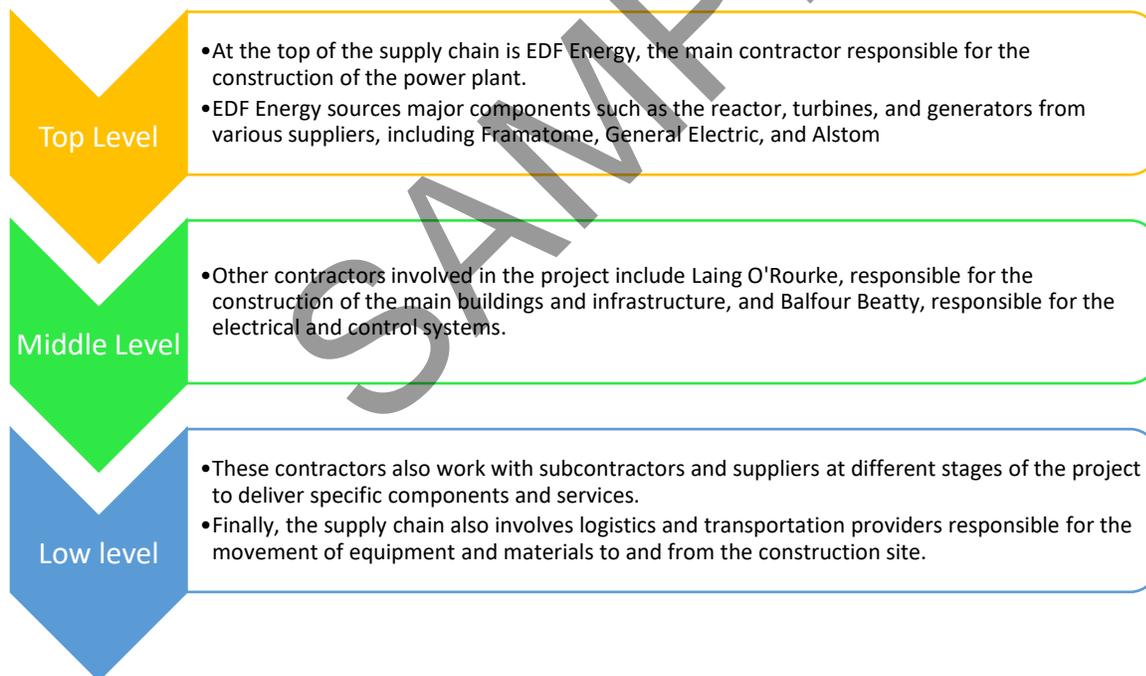


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Supply Chain Management

The management and coordination of all activities associated with the sourcing, procurement, production, and delivery of goods and services are known as supply chain management. This encompasses several functions, such as logistics, planning, inventory management, and quality control (Glasson et al., 2021). In the case of a large project such as Hinkley Point C, supply chain management is crucial to ensure the timely and high-quality delivery of materials, equipment, and resources. Effective supply chain management can help to minimize project delays, reduce costs, and ensure the project's completion within the predetermined timeline (Glasson et al., 2021).

Sketch the Supply Chain Diagram for this Mega Project



Upstream, Mid-Stream And Downstream Stakeholders And Partners

| Upstream Stakeholders and Partners | Mid-Stream Stakeholders and Partners | Downstream Stakeholders and Partners |
|------------------------------------|--|--|
| EDF Energy (developer) | Nuclear Industry Association | UK energy consumers |
| UK Government (regulator) | Major contractors (e.g. Bouygues TP, Laing O'Rourke) | Local communities |
| Local councils | Equipment and material suppliers | Businesses and industries dependent on electricity |
| Trade unions | Trade associations | Environmental organizations |
| Landowners | Unions representing construction workers | Transport and logistics companies |
| Research institutions | Engineering consultancies | Energy market regulators |

Routine, Leverage, Bottle-Neck And Strategic Service Providers

For the Hinkley Point C project, the service providers can be classified into four categories: routine, leverage, bottleneck, and strategic. Each category has a different level of importance and impact on the project's success.

| Type of | Description | Examples |
|---------|-------------|----------|
| | | |

| Service Provider | | |
|------------------|--|---|
| Routine | Provides basic services and supplies that are commonly available in the market. | Office suppliers, IT services, maintenance services |
| Leverage | Provides specialized services or supplies that are not easily available in the market and are critical to the project's success. | Nuclear engineers, construction equipment suppliers, specialized construction workers |
| Bottleneck | Provides services or supplies that are critical to the project's success but have limited availability in the market. | Key components manufacturers, specialized transport services |
| Strategic | Provides unique and critical services that directly impact the project's strategic goals and objectives. | Government regulators, financing institutions, major investors |

Strategic Risk Management

The Hinkley Point C project involves significant risks, including technical risks, environmental risks, and financial risks (Smyth, Lecoivre and Vaesken, 2018). Effective risk management is essential to guaranteeing the project's success. The first stage in effective risk management is the identification of potential risks (Kaminsky and Zerjav, 2016). The project team must undertake a thorough risk assessment to identify all potential hazards, estimate their likelihood, and establish their potential impact on the project (Kaminsky and Zerjav, 2016).

The project team must determine the likelihood and impact of risks when they have been recognized. This entails calculating the possible impact on the project should each risk materialize as well as determining the likelihood that it would. For instance, a nuclear reactor malfunction could have a disastrous effect on the project's budget and schedule (Daniel and Daniel, 2019). After assessing risks, the project team must develop strategies to mitigate or manage them.

Potential Strategic Risk of this Mega Project

Effective risk management requires a proactive and systematic approach throughout the project lifecycle. This involves ongoing risk monitoring and evaluation to ensure that risks are identified and managed in a timely and effective manner (Smyth, Lecoivre and Vaesken, 2018).

The table below shows risks and risk management strategies for the Hinkley Point C Project:

| Risk | Potential Impact | Risk Management Strategy |
|--------------------------------------|--|---|
| Technical failure in nuclear reactor | Catastrophic impact on timeline and budget | Develop contingency plans, identify risk triggers, and implement risk management strategies throughout project lifecycle |
| Environmental damage | Damage to local ecosystem, negative impact on reputation | Implement strict environmental monitoring and mitigation measures, engage stakeholders in environmental impact assessment |
| Supply chain disruptions | Delays and cost overruns | Develop contingency plans, diversify supply chain, and establish clear communication channels with suppliers |

| | | |
|-------------------|---|--|
| Public opposition | Project delays, negative impact on reputation | Engage stakeholders in transparent and collaborative manner, address concerns and needs during planning and implementation |
|-------------------|---|--|

Recommendations

Based on the analysis of the Hinkley Point C project and the five Mega and Complex principles discussed above, several recommendations can be made to improve the management of Mega and Complex Projects and achieve value for money.

- It is crucial to give priority to engaging stakeholders throughout the entire project duration. This entails establishing a transparent and collaborative communication process with all stakeholders to ensure that their concerns and needs are taken into account during both project planning and implementation.
- The principle of risk management should be integrated into all aspects of the project, requiring a proactive and systematic approach to identifying, assessing, and managing risks. It is important to develop a comprehensive risk management plan that is regularly updated throughout the project lifecycle and includes all stakeholders in the process.
- Emphasizing the principle of sustainability is of great importance, and it should be given a high priority. Sustainable practices should be implemented throughout the project lifecycle, including minimizing the project's environmental impact and promoting social and economic benefits for the local community.
- To improve project outcomes, it is essential to foster collaboration among service providers. Encouraging collaboration and coordination among service providers can help reduce bottlenecks and lead to better project results.

Conclusion

The execution of the Hinkley Point C project has been fraught with many challenges due to its vast size, complexity, and extensive stakeholder involvement. To ensure its success, the project management team has had to employ several strategies, methodologies, and tools. The program management life cycle has provided guidance from inception to closure, and effective supply chain management has been crucial to the project's success. Despite facing multiple issues and challenges, the project has also offered numerous opportunities for learning and improvement. To ensure continued success with the project's implementation, it is crucial to maintain effective stakeholder management, prioritize activities based on their complexity and impact, and continuously evaluate and enhance the project's management strategies.

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