Process and Techniques in Construction Cost Management in Irish Organizations

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Abstract

The construction industry has been evolving over the years, adapting to materials, designs, methodologies, and client's needs. These changes have significantly influenced cost management practices in construction projects, often resulting in deviations from the initial project budget and causing cost overruns. The study aims to address four objectives; explore cost control techniques during the construction lifecycle, examine recurrent factors influencing effective cost techniques, assess the involvement of construction consultants in cost management practices and investigate challenges encountered by project managers.

Through a deep analysis of the literature on construction industry practices, cost management methodologies and factors affecting cost budgets, this study aims to provide valuable insights into improvements or implementations that can be made in Irish construction organizations to effectively achieve estimated project costs.

Declaration

I L Daniela, hereby declare that this dissertation entitled " Processes and Techniques in Construction Cost Management in Irish Organizations ", submitted to the National College of Ireland for the award of MSc in International Business, is entirely my work, except where otherwise acknowledged by references. This study does not contain any material that has been submitted for any other degree.

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Introduction

The high-speed advancement in the global construction industry has accentuated the crucial role played by companies operating within this sector. However, a comprehensive challenge persists in the field of project control. Even with the presence of vital personnel, the companies frequently experience profit loss or mismanagement of control over their projects. The research will identify key factors contributing to cost exceed, as well as successful cost control techniques employed in different project stages. The research will highlight the significance of collaboration, technology adoption, and innovation in optimizing cost management practices and achieving desirable project outcomes in Irish organizations.

(Jackson,2002) analyses the perspective of cost estimators about the causes of cost overruns and lists the five main reasons that happen to exceed the initial budget, these are; design changes, design development, information availability, design brief, and estimating method. (Jackson,2002) seeks the potential control techniques and recommendations to achieve cost objectives effectively in the UK.

A study by (Oyegoke, et al.2022) demonstrates factors affecting effective cost-control methods, evaluating the techniques of proper cost management in the UK construction industry, and analyses that budgeting and cost forecasting are the most effective techniques that will not cause cost overruns in projects. On the other hand, the less used techniques are earned value and resource monitoring, mentioned as ineffective for cost management. The study “Factors Affecting the Selection of Effective Cost Control Techniques in the UK Construction Industry” performed semi-structured interviews, and explained the methods that managers take into consideration in a project, these are, time and risk management. (Oyegoke et al. 2022) emphasizes the significance of engaging cost consultants during the design phase to provide cost guidance and suggests focusing on controlling construction changes even though it's not usually the job of cost consultants.

To successfully achieve any project, the project manager is the main character in contributing favourable results.(Dlamini and Cumberlege 2021) explores the efficacy skills that construction project managers might apply in order to mitigate cost overruns.

The studies mentioned earlier have highlighted the cost management problem and its global impact on the construction industry. The exploration continues to identify cost-effective techniques that can help Irish organizations to efficiently achieve projects within the estimated cost.

Literature Review Chapter

The literature review analyses the current cost management techniques in the construction industry and examines the factors affecting their effectiveness to align the investigation to the Irish Construction Industry. Studies by (Jackson, 2002.,) (Oyegoke et al. 2022) and (Dlamini and Cumberlege 2021) were conducted outside Ireland, providing insights to comprehensively understand the framework of the study.

The construction industry has been changing over the years, adapting to materials, designs, methods, and clients, all of which significantly impact effective cost management strategies. Such changes have significantly influenced cost management practices within construction projects, often leading to deviations from the initially established budget. In light of this context, the literature review undertakes a comprehensive examination of construction industry practices, and project management methodologies. To furnish valuable insights into the performance of construction cost management within Irish organizations.

3.0 Construction Industry in Ireland

In 2022 investment in the Irish construction industry grew by 9% according to the report by FIEC - European Construction Industry Federation (2023) anticipates a gradual deceleration in growth, with projections indicating a slowdown to 2.5% in 2023, followed by a moderate uptick to 4.1% in 2024. “Increased government expenditure, attractive tax incentives and an increased demand in housing” (Graham and Thomas, 2005, p. 503) are factors contributing to the growth output in the Irish construction industry. The primary focus of investment in Ireland goes into building houses. According to FIEC - European Construction Industry Federation (2023) 29, 851 new

houses were built in 2022. However, the number of housing unit permissions in 2022, decreased by 20,5% to 34,177 units from 42,991 units in 2021, producing some concern in the industry.

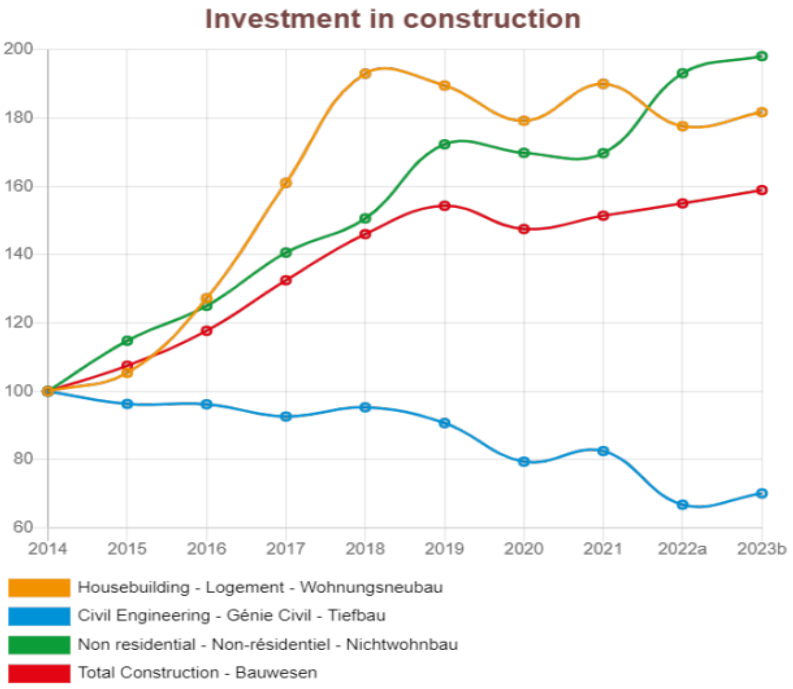

Figure 01. Investment in construction FIEC - European Construction Industry Federation (2023)

The construction industry is, however, facing challenges in the public procurement rules, lack of communication between stakeholders, weak technology and the process of working. The construction sector has often needed to adopt innovative technology and ways of working, affecting the industry globally in providing projects on time and within budget. “The Irish Construction Industry is no exception in this regard and has troubles relative to time and budget on major projects” (Toland and Collery 2023). New strategies in the field need to be extended to how the processes emerge over time in response to an improvement in the construction industry.

(Toland and Collery 2023) explained that traditional management techniques in the Irish construction industry are focused on prioritising commercial performance, limiting the opportunity to improve it. (Toland and Collery 2023) recommends that the

government, stakeholders, managers, and leaders change their perspectives on project management techniques and adopt a more receptive attitude towards change.

3.1 Companies in the “Irish Construction Industry”

Construction companies play a crucial role in the industry by taking on primary responsibility for project oversight. “The production of these companies is the construction of a facility using a series of specific processes and procedures” (Pellicer, et, 2015 p. 45) The construction companies have the responsibility to arrange a group of subcontractors and specialized suppliers to plan the work by selecting the appropriate management techniques.

The (Irish Construction News, 2024) has ranked the top 20 Irish building contractors. Established in 1859 John Sisk & Son holds the position as the leading company in the list with a total turnover of €1.73 billion. With ongoing expansion in the Data, Information and Communications Technology, Life Sciences, Advanced Manufacturing, Commercial, Retail, Civil Engineering, and Pharmaceutical sectors, the business has played a key role in the evolution of the Irish construction industry. In 2020 John Sisk & Son assumed control of Sensori Facilities Management specializes in offering integrated facilities management services, intelligent building solutions, energy management, planned preventative maintenance, and complete turnkey project delivery to its clients in Ireland. (Graham, et., 2007) conducted a study on how knowledge management impacts John Sisk's ability to retain clients in a management contracting role. This led to the establishment of new divisions specializing in Civils and Transportation, Bio-Pharmaceuticals, and Residential sectors.

Positioned at number seven among the top 20 is the Pj Hegarty & Son company (PJH), founded in 1925, posses a turnover of €500 million, the company specializes in commercial, retail, tourism, pharmaceutical, high-tech and institutional buildings, refurbishment and civil engineering projects. The company culture is based on financial and management principles and because of that, it has placed the company at the lead of the Irish construction industry. (Graham and Thomas, 2005) conducted interviews on the implementation of “lessons learned (LL)” techniques as part of knowledge management in PJH company.

The success of a construction company relies on efficient knowledge management (Gurteen, 1998). This concept refers to a developing group of principles, processes, structures, applications, and technologies that aid knowledge workers in leveraging their creativity and delivering business value.

3.2 Project Management

To comprehend the research, first, it is essential to examine the discipline of project management and the process of proper control in any project. Management “is an ideal process for managing risk, the concept being to identify the risks at the earliest possible opportunity and then proactively manage them”(Potts, 2008 p. 161). The two components of the project management approach as “the project life of cycle and the management process” (Turner, 2008 pp. 235). The project life cycle is the stages of an idea, from planning to making it real and beneficial, and the management process is the procedures that persons follow in each stage to deliver a project.

(Turner, 2008) reviews four factors that influenced achieving successful results. The first one is establishing the project, which is how the project aligns with the organization and its business plan, defining the procedures for controlling projects and communicating priorities between stakeholders. The second factor is planning the project, this part is to select the system of work, the time, cost plans and methods of communication with the project team. This factor can be set by a breakdown structure, the most common is WBS (work breakdown structure), to distribute activities in each stage of the project and the proper leader of each one. The third factor is organizing and implementing the project, this is to coordinate the project activities and assign specific work responsibilities to each team member in alignment with the project objectives. Finally, the fourth factor is controlling the project, this part is to understand the importance of monitoring the process, comparing progress to the plan and making necessary decisions to achieve the project's targets.

3.3 Cost Management

Cost management encompasses more than keeping track of spending and making project reports, is a process that encloses all the activities needed to ensure effective financial oversight of construction projects. Evaluating costs, preparing estimates, setting budgets, monitoring expenses, analyzing trends, forecasting future costs, and reporting on financial performance are processes that work together to help manage a project's financial health from planning to completion. Cost management necessitates a proactive approach to control, which means understanding why costs occur and taking the correct action in light of this information. (Anyanwu, 2013) analyse through interviews the importance of cost management as a process of utilising construction cost-related resources to achieve project objectives through effective planning and control. It also highlights the need for innovations in cost management for viable construction projects. It discusses tools like the Gantt chart and cost analysis used for project planning, monitoring, and controlling costs in construction projects.

To apply effective cost management, it's crucial to understand the basis of pre-contract estimating, defined by (Potts, 2008) as the process of “setting the original budget and forecasting the likely expenditure to the client”. (Potts, 2008) divide into two steps the pre-contract estimating included, cost estimating and cost budgeting.

3.3.1 Cost Estimating

(Potts, 2008) identified the importance of precontract estimation which forecasts the client's possible expenditures and establishes the initial budget. This estimate included all costs related to materials, labour, equipment and overhead. Based on the (Potts, 2008) explanation, cost estimating must be applied in the design stage through four ways of techniques, these are; function or performance-related, size-related, elemental cost analyses and unit rates. However, the technique more suitable for estimating is the elemental cost analysis, which can be adjusted for time, amount, quality, and location to get a building estimate.

Therefore, whenever a cost estimating exercise is being conducted, (Bina, 2008) recommended that the elemental cost analysis be referred to along with additional necessary documentation like the project price, drawings showing plans and elevations, and a list of elements. Nevertheless, the cost data isn't always reliable,

which can lead to a loss of accuracy and sometimes context. Construction cost estimation requires careful consideration of multiple factors such as market conditions, specification levels, inclusions and exclusions, services, site and foundation conditions, also and an understanding of the complexities of construction activities to achieve reliable and accurate estimates.

3.3.2 Cost Budgeting

Cost budgeting may sound similar to cost estimating, however, these are two different processes that are interrelated in cost management. The cost budget sets the realistic cost for a project, including the expenditure for a client in each construction stage, this budget is according to the project's scope. The cost budget influences project decisions and determines whether a project will proceed, making it a key factor in project planning and control. (Cunningham, 2015, pp. 17) cites " When estimated cost is approved by client and organization, this becomes the authorised project budget described as cost limit". Effective cost control at this early phase can help identify potential cost-saving opportunities and prevent costly overruns later in the project.

3.3.4 Cost Control

The process of identifying critical deviations and implementing early corrective action in a project by assessing, evaluating and tracking actual spending with the project's budget is known as cost control. Controlling offers quantitative data that can direct choices and regulate actions to guarantee that everything is proceeding according to plan. (Al-Jibouri, 2003) considered the steps in the control cycle as:

1. Make a plan
2. Implement the plan
3. Monitor actual output and record it
4. Report actual and planned parameters and their variations.
5. Take action

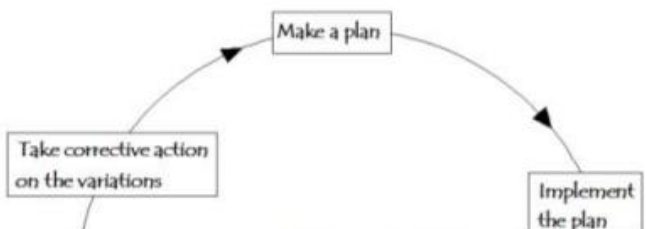

Figure 02. (Al-Jibouri, 2003) Monitoring process

The researcher (Cunningham, 2015) discusses the importance of cost planning and control procedures in Ireland, organized according to systematic plans of work, identifies potential cost overruns and proposes corrective actions to achieve the client's objectives. The selection and implementation of efficient and effective techniques and procedures of cost control are the basis for maintaining a project within the estimated budget.

3.4 Cost Control Techniques in Construction Lifecycle

Cost control must be applied within techniques in order to effectively achieve the project cost estimated. Currently, organizations implemented a series of mechanisms using the most common such as work breakdown structure (WBS) See appendix 01., earned value analysis, actual vs forecast of labour and materials, and budgetary controls. Some contractors still fail to meet their estimated profit margin at the end of a project, despite their best efforts to control costs. This is because many contractors' cost management systems are not continuous. According to (Perera, et. 2022) the current techniques are not well established in the organization’s process, in the study “ Contractor’s Perspective on Key Performance Indicators of Cost Control in Asian, Middle Eastern, and European Construction Projects” the researcher

conducted interviews with experts to categorize the techniques and tools used in cost control in the initiation, execution and closing of the construction stages.

3.4.1 Initiation Stage

According to the study (Perera, et. 2022), seven techniques are identified as essential for the initiation stage, this part includes preliminary project estimate, project budget, application of cost planning, cash flow, development appraisal, life cycle cost and contingency plan. Cost planning techniques may decrease the cost of projects.

3.4.2 Execution Stage

The techniques identified as essential (Perera, et. 2022) in the execution stage are contract management, work programme, keeping records, earn value management, cost value reconciliation, value engineering, new software, schedule performance variance, cash flow, profit or loss of each contract at payments, gain/loss purchasing, risk management, risk register during design, cost impact from design changes and savings for value engineering. The execution stage is the hardest through the construction because is when the losses start and unpredictable risks happen. Cost control through this stage must be standardised (Oyegoke et al. 2022) presents the challenges for implementing effective cost control during this stage of the construction, analysing if the impact of new technology has improved the effectiveness of cost control.

3.4.3 Closing Stage

In the closing stage, four techniques are enlisted penultimate/ final accounts, material reconciliation, profit percentage and retention management (Perera, et. 2022). To effectively succeed at the end of a project usually depends on the closing of final accounts, the process requires coordination among various stakeholders and attention to financial details, involves, revision of contract documents, reconciling payments and invoices, settling changes orders, conducting a final site inspection, prepare final financial statements and obtain final approval of the client. Properly closing accounts helps to ensure that all parties receive fair compensation, meet their contractual obligations, and the project is formally concluded.

According to (Oyegoke et al. 2022) the effective cost control techniques in the UK construction industry include budgeting, cost forecasting, and cash flow

monitoring. To reduce cost overruns, control of design change is crucial. Also the work of ((Oyegoke et al. 2022) emphasises the need for the involvement of cost consultants during the design stage and effective management of design changes.

3.5 Factors Affecting Cost Control Techniques

Implementing cost control techniques in the Irish construction industry can be challenging. Several factors contribute to these difficulties, often the organization doesn't have established the proper process for addressing problems, producing a risk in the project. Understanding the factors affecting the construction industry is key to exploring the research to address the main problem with suitable recommendations. The study "Factors Affecting the Selection of Effective Cost Control Techniques in the UK Construction Industry" by (Oyegoke et al. 2022) explores the problem of companies establishing cost management techniques and identifies factors into nine broad themes; price and cost, delay and extension of time, project management, design issues, construction issues, payments, contractor-specific factors, consultant-specific factors, and force majeure. See Appendix 02.

The most common factors are inaccurate time and cost estimations, fluctuation of material prices, lack of communication, delays in procurement and decision-making, poor design, construction mistakes, financial difficulties, and contractor-specific issues like cash flow problems and rework, with factors like cost information, company size, and technique effectiveness influencing their selection.

(Olawale and Sun, 2010), identify factors of project control in the UK construction industry and develop mitigating measures through a combination of qualitative (semi-structured interviews) methods. The research involved experienced practitioners from various companies, aiming to explore common practices, tools, and challenges in time and cost control. Mitigating measures were developed based on analysis of interview transcripts and existing literature, to address the identified problems effectively. The factors according to the researchers (Olawale and Sun, 2010), include design changes, inaccurate evaluation of project time/duration, complexity of works, project risks and uncertainties, non-performance of subcontractors, lack of proper training and experience of the project manager,

discrepancies in contract documentation, conflict between project parties, and unpredictable weather conditions.

3.6 Project Managers Role and Challenges

Project managers in the construction industry have an essential role in the construction industry, they oversee the building procedures, make sure the construction site is safe, guarantee the quality of the project, and make sure local delivery is done on schedule and under budget and time. Project managers have the challenge of embracing additional tasks throughout the construction process, not only to increase their technical and management knowledge but also the facilitate cost-performance skills. (Edum-Fotwe and McCaffer, 2000) studied the challenges contributing to professional competence in project management within the construction industry, including management knowledge, advanced technology, and development of practice. The study “Developing Project Management Competency “ by (Edum-Fotwe and McCaffer, 2000) analysed the background and experience of project managers and attitudes towards challenges for competency. The research approach involved using interviews to collect data on the knowledge, skills, and experiences contributing to professional competence among project managers.

(San, et. 2017) identified the important roles of project managers in building development in Malaysia, demonstrated the challenges facing represented as bad working attitudes and practices in the construction industry, involvement of new technologies and business ideology, also the author identified possible solutions to overcome these challenges.

Project managers are essential throughout the entire construction lifecycle. Therefore, it's important to explore the challenges affecting their ability to control costs in the Irish construction industry.

3.7 Involvement of Construction Consultants

The traditional project management system has been used improperly at some stages of the construction lifecycle, making projects more complicated and challenging in terms of technical, logistical, monitoring, and financial aspects. When a project

presents these difficulties, various strategies are considered to offer potential solutions. In this case, the construction manager and construction company involved a consulting service to coordinate, plan, control, and manage the construction lifecycle (Potts, 2008).

(Wouter, 2018) studied the role of consultants in the Dutch construction industry through a case study, demonstrating their ability to facilitate project progress, control risk, and manage project timelines. The author also shows how consultants can take responsibility for providing communication among stakeholders to ensure that all parties have the correct and clear project information.

The authors (Masengesho, et. 2021) explore the relationship between project consultants' performance and project success in the Rwandan construction industry. The study demonstrates the relevance of consultants in achieving successful project outcomes by supporting the management team in reducing the risk of cost overruns, monitoring timelines, and delivering a quality project to clients.

3.8 Summary Literature Review

The literature review provides a comprehensive analysis of studies related to processes and techniques in construction cost management in Irish organizations. The themes explored in the literature review include the Irish construction Industry, Companies in the Irish construction Industry, project management process, cost management specialization, cost control techniques in the construction lifecycle, factors affecting cost control techniques, project managers' role & challenges and involvement of construction consultants.

An analysis of the literature reveals strengths and limitations in the field. The limitation in identifying similar aspects related to the Irish construction industry has been tough for researchers, however, the current analysis of literature will be used as a conceptualization for our study to address the research into the Irish construction Industry. Theoretical frameworks (Jackson, 2002; Oyegoke et al. 2022) and Perera, et. 2022) are frequently employed in the literature and provide valuable insights into the research. These frameworks support the researcher's approach to exploring the topic and addressing the problem in the Irish construction sector.

Methodology Chapter

4. Research objectives

- To investigate cost control techniques in the construction stage to guarantee projects are achieved effectively at the estimated costs.
- To study the recurrent factors influencing effective cost-control techniques in the Irish construction industry.
- To examine the proactive involvement of construction consultants in cost management practices.
- To investigate the challenges managers encounter in the construction industry.

5. Research questions

What cost control techniques can Irish construction organisations implement or improve to achieve project-estimated costs effectively?

Using the appropriate cost control techniques in the construction industry may improve the cost performance of the project. These cost control techniques are affected by many factors, which can cause a cost overrun in the estimated cost. It is essential to identify the factors causing these cost overruns by considering their frequency and impact on the project.

This study aims to identify and analyse the cost control techniques in Irish organisations within the construction industry and assess the potential changes to reduce cost variance in construction projects.

Subquestion 1: What factors affect the ability to control construction costs?

(Oyegoke et al. 2022; and Olawale and Sun, 2010), authors demonstrated some crucial factors contribute to cost overruns and cause challenges for companies in implementing effective control techniques.

Subquestion 2: What is the importance of involving construction consultants to achieve cost control construction?

(Wouter, 2018) and (Masengesho, et., 2021) indicated the relevance of including an independent party who leads the cost control during the construction project in order to achieve a successful cost project.

Subquestion 3: How do the challenges faced by project managers affect their capability to control costs in the construction industry?

(Edum-Fotwe and McCaffer, 2000) and (San, etc., 2017) explained the high responsibility of project management practitioners in the construction process, however, there are some challenges faced by project managers in the construction industry that affect their capability to successfully implement management procedures.

6. Research Methodology

The study explores the current problem facing the Irish construction industry in cost management. It sheds light on the processes and techniques used in Irish construction companies and what techniques can be improved to achieve project-estimated costs effectively. To create the proper research methodology, it was studied the “research onion” (Saunders, et. 2009) The research onion thoroughly explains the primary layers or steps that must be completed to create a working technique.

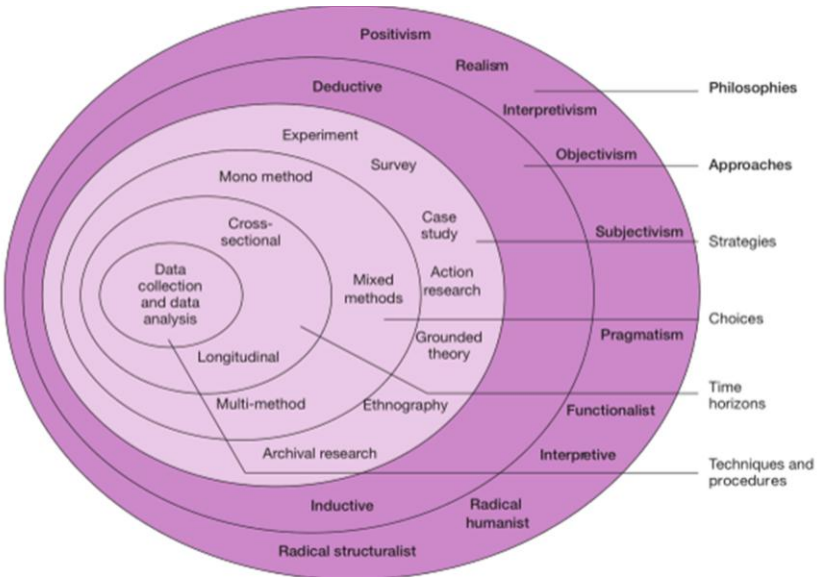

Figure 03. Re

The research methodology starts by defining the primary philosophy, selecting methodologies, methods, and approaches, as well as setting time frames. These steps

together bring the research logic to the design of the study, which comprises the primary methods and processes for collecting and analyzing data.

6.1 Research Design

6.1.1 Research Philosophy

In order to analyse the (Saunders, et. 2009) methodology, it is established interpretivism as the research philosophy. This philosophy focuses on understanding the subjective experiences and interpretations of individuals, according to research objectives, the study is focused on determining the perception of project managers in the Irish construction industry, its believed that providing an interpretivism approach is the proper methodology for achieving the aim of the study.

6.1.2 Research approach

The research approaches classified by (Saunders, et. 2009)are deductive and inductive. Inductive reasoning is primarily linked to "intuitive" methods, although deductive reasoning, is based on physical arguments, and is designed to regulate functions and guide knowledge. The approach that is more according to the philosophy and objectives of the study is the inductive approach. This approach will be applied to examine cost management techniques in Irish organizations collecting data based on qualitative methods.

6.1.3 Research Strategy

The importance of selecting an adequate research strategy must be enabled to answer the research questions and meet objectives(Saunders et. 2009). The study involved exploratory research conducting semi-structured interviews with 4 participants to gather primary data. Semi-structured interviews are used to obtain detailed and trustworthy information from practitioners by asking them open-ended questions. The data collected by interviews will be supported by a literature review using previous academic journals, demonstrating a rigorous examination of construction cost control techniques. The selected strategy approach emphasizes a qualitative comprehensive manner, providing a detailed exploration of what cost

control techniques can Irish construction organisations implement to achieve project-estimated costs effectively.

6.1.4 Research Methodological Choice

According to (Saunders, et. 2009) three different methodological choices can be applied, the qualitative, quantitative or mono method (a mix of the two methods). After analyzing the methodology approach, it has been concluded that qualitative research would be suitable to achieve the aim of the study. Previous studies have demonstrated the objective of implementing qualitative research on this topic, the extension of information related to cost management techniques makes the correct decision to conduct the research.

6.1.5 Research Time Horizon

As described by (Saunders, et. 2009) the time horizon refers to the timeframe chosen by the researcher for study analysis. It's divided into two types: cross-sectional, which focuses on a specific point in time, and longitudinal, which involves diary-like studies that represent events over a certain period. The study examines the present perception of cost management techniques among project managers in the Irish construction industry. As a result, it is decided to apply a cross-sectional approach, to explore what cost control techniques can Irish construction organisations implement to achieve the project estimated costs.

6.1.6 Research Sample

In order to gather data from a population, it is important to choose a sample carefully. There are two common types of samples used in research, namely probability and non-probability sampling techniques. The sampling selected is non-probability. According to (Saunders, et.,2009) non-probability offers various methods to select a sample based on subjective judgment. Instead of selecting participants randomly, this technique aims to be more selective in choosing participants to achieve research objectives.

The sample techniques used in non-probability are quota, snowball, purposive, self-selection and convenience sampling. This study proposed snowball sampling,

which is used when it's difficult to access the target participants, and the main challenge is to establish the first contact. Once this is done, additional participants can be recruited from their network, which creates a "snowball" effect and helps to increase the sample size. In this research, conducting interviews with project managers from John Sisk and PJH companies poses a significant challenge. Nevertheless, once the first interview is arranged, the researcher suggests to the interviewer the opportunity to connect with a different member of their company.

6.1.7 Implement the sampling

The initial target participants are selected according to their specific characteristics of interest. According to the literature review it is selected main construction companies that lead in the Irish construction Industry. The first is John Sisk placed as the leader of building contractors in the Irish Construction News list and PJH Harty ranked in the seventh place on the list. In order to implement the sampling it is identified a small group of project managers from the two construction companies John Sisk and PJH Harty. To make the initial contact, it is considered to connect them through the social networking site LinkedIn. After the initial participants agree to be interviewed, are asked to refer or recruit other people from their social network who also meet the research's criteria. This involves direct referrals, providing researcher contact information or extending invitations. As more participants are recruited, the method continues, with each new participant being asked to refer others. The process continues until the needed sample size is reached or is collect the necessary data.

6.1.8 Data Collection Instruments

The interviews involve direct contact with the researcher and responder and consist of gathering the point of view of the participant in line with the research questions and objectives. (Saunders, Lewis, and Thornhill, 2009) Based on the level of formality and structure, interviews can be categorized into; structured, semi-structured, unstructured or in-depth interviews. The data collection instrument selected is semi-structured interviews, which establishes the questions and topics that

need to be covered, however, there may exist the opportunity to deviate from the script to explore interesting responses or ask follow-up questions, this tool it's a balance between structure and flexibility. The interviews are conducted via phone or video meeting program, which provides an accessibility medium for participants as well as for the researcher. A target of 4 interviewees has been chosen for the study, taking into account a sample size of 12 project managers. This sample is divided between 50% of participants from John Sisk and 50% from PJH Harty company.

The aim of using semi-structured interviews in the research is to understand complex issues in cost management techniques, gather detailed insights about the construction industry and explore project manager's experiences.

6.1.9 Data Analysis Techniques

To analyze the qualitative data collected from semi-structured interviews, thematic analysis is used to identify and explore patterns or key themes. First, the interviews will be transcribed to generate initial codes by labelling relevant segments of data to capture key ideas . Second, themes will be identified based on these codes, and then reviewed to ensure they align with the collected data. Finally, the data will be categorized according to research objectives. Table 01 shows the interview questions and their relation to the research objectives.

Interview Questions	Research Objectives
"What cost control techniques do you identify as essential for the initiation, execution and closing construction stages?"	Objective 01
"Are there any common factors that affect the cost management process of the construction?	Objective 02
" What cost mitigation measures would you suggest to put in place to reduce the factors affecting cost management?	Objective 02

“What benefits do companies gain from incorporating construction consultancies into their projects?”	Objective 03
“In your opinion do consultants have more knowledge about cost management and can easily apply better strategies?”	Objective 03
“What are the most challenging aspects of your job as a project manager ?”	Objective 04
“What solutions would you suggest to overcome challenges faced by project managers?”	Objective 04

Table 01. Interview questions related to objectives.

6.2 Ethical Considerations

This research is guided by ethical principles and regulations to ensure the protection of participants’ rights and security through the research process. Participants were informed before data collection commenced, providing them with detailed information about the purpose of the research, objectives, methodology involved and their right to withdraw from the study without penalty. Participant confidentiality and anonymity were strictly maintained throughout the study. Participation in the study was voluntary, and participants were assured that their decision to participate would not affect their relationship with the researcher or any organizations.

This study was conducted in accordance with the ethical guidelines outlined by the General Data Protection Regulation (GDPR) as well as the ethical principles of the European Union’s guidelines on Ethics for researchers (European Commission, 2013). The researcher conducted this study with honesty, integrity and transparency, adhering to ethical standards during the research process. The ethical considerations encompass informed consent, confidentially, data control, voluntary participation, compliance with ethical guidelines, permission and approval and honesty and integrity, which are fundamental principles of the study.

7. Findings

The interviews were conducted with a sample of 4 construction project managers, this selection was according to the proposal research methodology. The participants are conform from 2 project managers from the company John Sisk and 2 project managers from PJH company. Table 01. illustrates the background of the participants.

Participant	Years of experience	Education	Types of project-managed
Participant 1 John Sisk company	8 years	BSc Civil Engineering Diploma in Technology in Construction Control.	Residential, industrial and pharmaceutical buildings.
Participant 2 John Sisk company	5 years	BSc Civil Engineering MSc Construction Management.	Residential, industrial and commercial buildings.
Participant 3 PJH company	7 years	BSc Civil Engineering Diploma Project Management.	Residential, and commercial buildings.
Participant 4 PJH company	5 years	BSc Construction Management and Engineering.	Residential, and industrial buildings.

Table 01. Interviewees background

The responses from participants were analyzed using the deductive thematic analyses method described by (Braun and Clarke, 2012) these responses were coded, which involved labelling relevant segments to capture key ideas and identify themes in line with the research objectives including investigating cost control techniques in the construction stage to guarantee projects are achieved effectively at the estimated

costs, to study the recurrent factors influencing effective cost - control techniques in the Irish construction industry, to examine the proactive involvement of construction consultants in cost management practices and to investigate the challenges managers encounter in the construction industry.

Table 02. demonstrates the five key themes for the qualitative analysis of processes and techniques in construction cost management in Irish organizations. The themes involve Cost control techniques in the construction stage, Recurring factors influencing cost control, Proactive involvement of construction consultants, Challenges Encountered by Project Managers and Solutions to Overcome Challenges.

Themes	**Codes**	**Illustrative Quotations**
Cost control techniques in the construction stage	Cost Estimating / Cost budgeting Project management tools Performance measurement Financial audits and reviews.	“In the initiation stage always must be applied project-estimated to define scope, budget and time” “The execution stage must be controlled through specific software, such as BIM” “Real-time cost tracking and performance measurement against the budget are essential.” “Conducting thorough audits and reviews allows us to understand cost variances”.
Recurring factors influencing cost control	Design changes and scope variation Communication issues Market and economic factors	“Project design changes affect significantly cost management performance”. “I will say the lack of communication between the personnel on site and the management team”. “Economic factors like inflation or changes in regulatory requirements also play a significant role”.
Proactive involvement of construction consultants	Consultant expertise and knowldage Consultant’s role in risk management Consultancies cost-savings strategies	“They bring specialised expertise that can enhance project efficiency and cost-effectiveness”. “Identify risks in the early stages of the construction and possible solutions to reduce risk”. “This expertise and knowledge allow them to identify and implement cost-saving strategies effectively”.
Challenges	Stakeholder	“Manage the diverse needs and expectations of

encountered by Project Managers	management Traditional construction practices Project scope and information compatibility	stakeholders while keeping the project on track and within budget". "Extend the management culture into organizations because of the traditional construction procedures" "Ensuring the compatibility of information, across diverse systems, stakeholders and teams."
Solutions to overcome challenges	Adoption of new technologies and methods Effective communication channels Continuous training and development	"Adoption of new software and methodology to improve the compatibility of documentation" "Establish communication channels for effective communication between team members and project managers" "Development of management practices in the organization's culture".

Table 02. Themes and Codes

7.1 Results

7.1 Theme 01 " Cost Control Techniques in the Construction Stage"

Cost control its been a critical aspect of managing construction projects, the main objective for companies is to complete the project within the budget and meet estimated costs. In this theme, the participants explained the relevant cost management techniques applied in their organization and the significance of using them accordingly to achieve effective cost control. The four participants were aware of the importance of established techniques and processes in the initiation, execution and closing construction stages.

A key technique mentioned by participants was cost estimating and cost budgeting. This involves assessing project costs to determine the financial framework at the initial stage, to set a project budget for the entire construction lifecycle. It also helps to establish the project scope and timeline. Participant 2 mentioned, "Project planning is essential for the initiation stage to define a timeline, scope and budget", clarifying the effectiveness of accurate cost estimates and budgeting techniques. Participants 1 and 2 stated: "The initiation stage is crucial for the project team",

demonstrating the relevance of implementing cost management techniques since the beginning of the project.

Another important technique highlighted by participants is the use of project management tools. Participant 01 responded, “The execution stage must be controlled through specific software, such as BIM (building information modelling)”, with this approach project managers detected risks in building systems, reducing project delays and costs associated with unexpected issues. Participant 4 mentioned a different tool stating “ The Gantt bar chat is used in our projects, it is applied in the execution stage to control the progress and manage resources”, this tool represents a visual timeline for project tasks, providing real-time cost tracking and monitoring through the executing stage, allowing project managers to have efficient control over the project performance. Also, Participant 3 emphasised the importance of performance measurement during the construction stage, stating “Performance measurement against the budget is essential through the execution stage, to ensure costs are aligned with the plan”, the regular monitoring of subcontractors and suppliers is essential for maintaining cost control, with this technique project managers can quickly identify and address cost overruns.

In the closing stage, participants determined that financial audits and reviews are essential for understanding cost variances throughout the project and identifying overall project profitability. Participant 3 stated, “Conducting thorough audits and reviews allows us to understand cost variances and apply lessons learned to future projects”, Participant 2 reflects a similar response relating to this stage “Overall profit and loss of the project helps us to determine final results”.

The responses of participants indicate that effective cost-control techniques require an integration of accurate cost estimation, cost budgeting, real-time tracking and continuing performance measurement. The application of management tools plays a significant role in keeping project performance on track.

7.2 Theme 02 “ Recurring factors influencing cost control”

The selection of effective cost-control techniques can be influenced by a variety of recurring factors. In this theme, participants were asked about common factors of

each project they have managed. Understanding these factors is crucial for project managers to effectively achieve cost management.

One of the most frequent factors mentioned by participants was design changes. Participant 2 stated “Design changes are tough to manage and usually cost more money” Participant 1 declared something similar to Participant 1, “ Design changes affect significantly cost management performance, leading to increased costs and reduced efficiency”. These changes can result from errors in the original design that were not identified in time, from client requests for modifications during the construction stage or from unforeseen site conditions.

Consequently, another factor affecting cost management is communication issues among team members, which can lead to delays and cost overruns. This is especially crucial when design changes or scope modifications happen without proper coordination. Participant 2 mentioned the “lack of communication between the personnel on site and the management team affects the way that design changes are controlled”. In this part, personnel on site don't communicate on time the changes or new client needs producing misunderstandings between members.

Also, Participant 4 was concerned about how scope modifications can affect the project performance, stating “We are committed to meeting client needs, however, when the client asks for new activities, we often agree before analysing costs”. Scope changes always require more resources, leading to increased costs that were not contemplated in the project plan. To complete the state from Participant 4, Participant 1 added how the incomplete documentation can cause delays and contribute to cost overruns, stating “imprecise evaluation of project duration is particularly because clients don't present all the documentation at the initial stage”, producing later modifications in the scope.

Additional factors identified by Participant 3 are material price fluctuations and labour costs, stating “ Economic factors like inflation or changes in regulatory requirements also play a significant role”. These are some external factors that are not possible to have control over, however, is always a factor that must be considered as a possible risk when the project is in the planning process, in order to assess possible solutions.

The responses suggest that effective communication, robust risk management, and change management are key strategies for mitigating factors. Participate 4 stated, “Implementing a strong change management strategy will affect positively project

performance”. By understanding and addressing these influences, project managers can better control costs and ensure project success.

7.3 Theme 03 “ Proactive involvement of construction consultants”

The involvement of construction consultants plays a crucial role in effective cost management in the construction industry. In this theme, participants emphasized the benefits of incorporating construction consultancies into their projects, they discussed how consultants contribute to cost control, risk management and overall project success.

Participants highlighted that construction consultants offer specialized expertise in cost management, Participant 3 states “ They bring expertise that can enhance project efficiency and cost-effectiveness”. Participant 4 stated something similar to Participant 3 “Their management expertise assists our project planning, ensuring a more realistic timeline, and helping us to maintain estimated cost”. With a deep understanding of project management practices, consultants can provide very useful comprehension of cost estimation, budgeting, planning times and coordination. Participant 1 expressed his opinion when he was asked if the consultants have more knowledge of cost management stating, “Their knowledge comes from work experience rather than theoretical management learning”, determined that this expertise enables them to apply practical solutions to complex challenges.

The consultants are particularly recognized for their ability to identify risks early in the project lifecycle. Participant 2 expressed “These consultancies can apply possible solutions to reduce risk”, by involving consultancies, construction companies can develop strategies to mitigate cost overruns and some other financial risks. The risk management approach is crucial for maintaining control over project costs.

Another key aspect of consultants’ involvement is their contribution to cost-saving opportunities by implementing innovative approaches, Participant 3 stated in this regard “ They often provide advanced tools and methodologies for project management and cost control”. Participant 2 made a similar statement to Participant 3 “I believe they have more knowledge of advanced tools and resources for cost analyses and cost strategies”. The consultants specialize in determined areas where

costs can be reduced without compromising project quality by implementing innovative approaches.

Additionally, the external perspective that consultancies provide, can propose some adjustments to improve cost efficiency. Participant 4 stated, “They have an external opinion that assists our project planning helping us to maintain estimated cost”. Offering an independent point of view, consultants can evaluate project performance objectively, helping project managers and stakeholders make better decisions because they have a clear understanding of important trends and risks in the construction sector.

In the main, the proactive involvement of construction consultants in Irish construction projects leads to improved cost control, risk management, and significant overall efficiency. Participants agreed that construction consultants’ knowledge and expertise are vital in ensuring projects are completed within budget.

7.4 Theme 04” Challenges Encountered by Project Managers”

Project managers in the construction industry face a range of challenges that may affect their capability to control projects. This theme, analyses the obstacles and difficulties that project managers encounter in their roles. Understanding these challenges will help to find effective solutions in this matter.

A major challenge identified by participant's responses is stakeholder management. It's difficult for project managers to ensure that all the parties, including stakeholders, subcontractors, suppliers and internal teams are aligned with project goals and timelines, Participant 3 stated “It is hard for me to manage the diverse needs and expectations of stakeholders while keeping the project on track and within budget ”. Besides handling all the tasks involved in managing the project, project managers must address everyone's needs, which can impact their ability to successfully control the project. This challenge is also related to communication issues. Participant 4 highlighted this, stating, “The difficulty of communicating management process among team and stakeholders is a challenge for me”. The problem of ensuring clear communication between personnel working on the construction site and the management team can lead to misunderstandings, delays

and cost overruns, particularly when design changes and scope modifications occur without proper coordination.

The compatibility of information across systems and teams is also another significant challenge. Participant 1 explained the reason for this challenge stating “Ensuring everyone is on the same page regarding project performance the data must be clear and easy to understand”. To ensure that all members receive the correct information, it's necessary the improvement of technological process to assist project managers' needs and make this process handly for everyone. This challenge also can be affected by traditional construction practices that the organization is used to applying, Participant 2 stated in this regard, “extend the management culture into organizations its tough for us, because of the traditional construction organization’s procedures”, the resistance to new management methodologies and adopt modern tools can impede project efficiency.

In summary, the responses indicate that project managers face a diverse range of challenges in applying effective management techniques. The key obstacles that organizations must look to improve project manager’s performance are stakeholder management, effective communication and adaptability of new management processes.

7.5 Theme 05 “Solutions to overcome challenges”

As mentioned before, project managers' challenges, including stakeholder management, communications issues and traditional management procedures, have been affecting their capability to control projects. In this theme, participants share their insights on effective solutions and strategies to overcome these challenges, offering practical advice for project management organizations.

One of the key solutions mentioned by participants is to improve communication by implementing effective channels among the project team and stakeholders. Participant 4 suggests that “regular meetings and encouraging transparency in the project environment” are communication methods that can enhance project performance. Participant 3 stated something similar to Participant 4 “ Strong communication skills are vital; keeping all stakeholders informed and engaged can

mitigate many issues". Implementing effective communication reduces misunderstandings that can lead to delays or cost overruns.

The adoption of new technologies and methodologies also was mentioned by participants as a possible solution to improve traditional management procedures. Participants emphasized that integrating modern project management tools can improve efficiency. Participant 1 stated, " Adoption of new software and methodology to improve the compatibility of documentation will help us to be more efficient". Participant 4 made a statement similar to Participant 1, stating "Continuous professional development and learning are also crucial to keep abreast of new technologies and methodologies in project management". Tools like Building Information Modeling (BIM) and Gantt charts enable real-time tracking and provide project managers with the information they need to make informed decisions. This solution also can be supported by the need for continuous training and development of management practices mentioned by Participant 2 stating " continuous training for project managers, teams and stakeholders to increase skills in areas like communication, risk asses and project management". By adopting consistent methods for managing project data, project managers can ensure that information is accurate and accessible to stakeholders, reducing errors and discrepancies.

To overcome the challenge of stakeholder management, participants recommend proactive stakeholder engagement. This involves understanding the needs and expectations of stakeholders and actively involving them in the project decision-making process. By maintaining open lines of communication and managing stakeholders' expectations, project managers can reduce conflicts and build stronger relationships.

To summarize, the solutions provided by participants offer a comprehensive approach to overcoming recurrent challenges in the Irish Construction Industry. By adopting new technologies, ensuring consistent information, and effective communication and promoting continuous training in the organizations, project managers can improve their capability to effectively achieve project costs.

Discussions Chapter

The discussion chapter leads into a detailed analysis and criticism of the literature review and the research findings, exploring the cost management

techniques, factors affecting project control, the role of consultants in enhancing project efficiency and project managers' challenges in the Irish construction industry.

The literature review presents the current problem in the construction industry which is not implementing a satisfactory structure in cost management procedures, this is affected by recurrent factors influencing project performance, and unestablished management techniques within organizations. (Jackson, 2002) presents research in techniques and recommendations to achieve cost objectives effectively in the UK construction industry in 2002, however, it has been demonstrated that cost overruns keep happening in construction projects. That's the main reason for exploring the factors that have been affecting cost project performance and techniques that have been applied in organizations to investigate if there are some new techniques and methods that should be incorporated to improve costs in the projects.

The four research objectives aimed to analyse the process and techniques in construction cost management in Irish organizations. The first objective focused on examining cost-control techniques during the construction stages to guarantee projects are achieved effectively within estimated costs. (Perera, et. 2022) , provide insights into the research by identifying cost techniques applied in the initiation, execution and construction stages of European construction projects. This supports research aimed at identifying the current techniques used by the two major Irish construction companies. The second objective relates to the analysis of the recurrent factors influencing effective cost-control techniques in the Irish construction Industry, using a scheme of the studies of (Oyegoke et al. 2022) and (Olawale and Sun, 2010). The literature review demonstrated how factors and what factors have been affecting cost management performance, producing a challenge for project managers and organizations to implement effective cost techniques. This insight emphasises the importance of continuing the exploration of factors affecting the ability to control construction costs to find some solutions to address them in the Irish construction Industry. The third objective examines the proactive involvement of construction consultants in cost management practices, taking insights from the study of the relationship between project consultant's performance and project success (Masengesho, et. 2021) and research on the role of consultants in the Dutch construction industry (Wouter, 2018). The examination of the literature review demonstrates the relevance of including consultants in the construction lifecycle, providing a better understanding of what is the importance of including consultants to

achieve positive cost control techniques in Irish organizations. The four objective focused on investigating the challenges managers encounter in the construction industry, using a framework from the studies of(Edum-Fotwe and McCaffer, 2000) and (San, et. 2017). The literature review identified the challenges related to the professional competence of project managers and suggested possible solutions to overcome these challenges. These findings support the purpose of the study, which is to explore the perspectives of project managers in Irish organizations and how challenges affect cost management techniques.

Subsequently, the findings from interviews offered a broad exploration of construction performance in the John Sisk and PJH companies, providing insights into the Irish industry. Thematic analysis was used to identify key themes and codes in participants' responses, revealing five themes that were analysed to present a comprehensive perspective on them.

Cost control techniques in the construction stage demonstrate the relevant techniques used by project managers in Irish organizations. Our study highlights the importance of analysing costs to determine a project's success by implementing key techniques including cost estimating and cost budgeting, which have been identified as the most effective when planning a project. These findings align with the literature review of the study (Perera, et. 2022) revealing project budget and cost are crucial techniques impacting positively the initiation of any project. Additionally, (Oyegoke et al. 2022) renamed “cost estimating” to “ cost forecasting” highlighting it as the most effective cost control technique. Another study shows the Gant Bar Chart as the most popular technique for planning time and costs to support the planning stage (Olawale and Sun, 2010). Furthermore, our study demonstrates also the relevance of the Gantt bar chart technique and reveals a new use for this management tool. It shows how project managers employ it during the execution stage to track the real-time costs of projects.

One significant insight we gained from this research is the implementation of the BIM management tool during the execution stage, this tool helps managers to have better control of the project and detect building risks on time, which can be successfully applied in new projects and other organizations to improve cost management.

According to the literature review (Perera, et. 2022), the success of a construction project strongly depends on the closing stage. To effectively succeed at the end of a project depends on penultimate/ final accounts, identified as the most

significant cost technique (Perera,2020). Contrary to previous studies, our research demonstrates that the most effective techniques are financial audits and project reviews, as they help project managers and stakeholders assess how well the project meets cost objectives. The findings suggest that these audits and reviews allow the project management team to identify potential cost variances and analyse final outcomes, providing lessons learned in future projects. The study by (Graham, et., 2007) supports the lessons learned method in the literature review, as part of the knowledge management in the PJH company. So, based on this previous research and our findings, it supports that during the closing stage, the technique of final audits and reviews is the most effective in Irish organisations.

Moving from the techniques identified, - cost estimating, cost budgeting, Gant bar chatt, BIM, financial audits and project reviews- let's consider the recurrent factors affecting their effectiveness. Our study identified key factors, including design changes as the most influential during the construction stage, often increasing project costs. This insight aligns with the work of (Oyegoke et al. 2022) and (Olawale, et. 2010), who found that design change is the main cause of cost overruns. The design changes are a recurrent problem affecting the construction industry. In order to mitigate this factor, this work discovered that implementation of change management can efficiently improve project performance. This approach guides how the Irish organizations plan, implement and control changes to meet project goals with cost budget. Change management also can reduce the other factors identified in our study, which are scope modifications and communication issues during construction. Communication issues align with the study of (Oyegoke et al. 2022)named “lack of communication” as the most common factor identified in their research. To finalize, our data indicate that economic factors are crucial in Irish organizations. These factors include changes in regulatory requirements and inflation in material prices. These findings align with a study by (Oyegoke et al. 2022)which, identified that “fluctuation of material prices” affects the UK construction Industry. The limitation of the literature review made it challenging to analyze factors in the Irish construction industry; however, previous research in the UK construction industry has provided insights that can help align findings with earlier studies to identify similarities in the construction industry.

Furthermore, this research shows that construction consultancies are valued for their ability to identify risks on time, their management expertise and their role in assisting with project planning, all of which can positively affect project cost

performance. Our findings, expand on the work of (Wouter, 2018), who demonstrated the role of construction consultants in project progress, risk control and management and how these aspects facilitate effective project management techniques in organizations. Our findings also support the work of (Masengesho, et. 2021) which highlighted the relevance of consultants in achieving successful project outcomes. Additionally, a key observation from our study is that consultants contribute to cost-saving opportunities by using advanced approaches such as efficiency tools and project management methodologies, providing an external perspective that can support organizational members in making more suitable decisions related to project performance.

Although consultants play a significant role in construction projects, another important element to discuss is the challenges faced by project managers in effectively implementing cost management techniques. This analysis reveals insights into stakeholder management, and traditional construction practices as crucial challenges affecting Irish project managers' capability to implement management techniques among organization members. This supports the existing body of knowledge in the study (Edum-Fotwe and McCaffer, 2000), which identified the lack of management knowledge, technology and development of practice as major challenges encountered by project managers, and the work of (San, et. 2017) which, identified as the deficiency of technology and techniques affecting project managers' efficiency. Our study introduces the idea of overcoming technological challenges by implementing or developing technological programs, like BIM software, which can positively affect organizations' procedures to provide project managers with a handy option to control and maintain clear information for stakeholders. This study underscores the need for further investigation into BIM methodology within the Irish Construction Industry.

By examining the challenges and possible solutions to overcome them, this study provided a fresh understanding of the need to develop strong communication skills by implementing communication channels like establishing regular meetings and encouraging transparency between parties, which will improve stakeholder management in Irish organizations. This finding lends support to the theory of (San, et. 2017) who demonstrates that improving communication and cooperation among team members has a positive impact on organization's work quality. The available literature review provided only partial insights into project managers' challenges in the

global construction industry; however, our study takes into consideration these insights to address the problem within Irish organizations.

In essence, our study underscores the importance of addressing factors in the Irish construction industry, the challenges faced by project managers, and the relevance of involving construction consultants to improve cost management techniques and implement new procedures to achieve cost estimates effectively in Irish organizations.

Conclusions and Recommendations Chapter

This study has provided an exploration of processes and techniques in construction cost management within Irish organizations. The construction industry in Ireland has been impacted by different circumstances, including public procurement rules, inadequate technology and management processes. The study's context focuses on major Irish construction organizations, such as John Sisk and PJH companies. These companies were selected due to their significant influence on the Irish construction industry, leading to an analysis of the most common techniques they employ in their management procedures.

The literature review delves into the specialisation of cost management in project management practices and the importance of controlling projects through cost techniques. It identifies the most effective techniques and processes during the construction lifecycle. However, according to the background of the analysis, certain factors affect their effectiveness when organisations and project managers attempt to apply them to their projects. These techniques are not only affected by internal and external factors but also their appropriate application is obstructed by challenges that project managers face within organizational procedures. This raises the question of what can be implemented or developed in organizations to achieve estimated costs effectively in projects using appropriate cost management techniques.

The research objectives were established to understand the cost control techniques in the construction lifecycle, the factors influencing their efficiency, the involvement of construction consultants and the challenges embraced by project management practitioners, all these objectives were related to the exploration of the project managers in the Irish construction industry.

Recommendations for future research

According to the findings the cost techniques most effective are cost estimating and cost budgeting for the initial stage, The Gantt chart bar for the executing stage and final audits and reviews for the final stage. Although our findings suggest the implementation of the BIM methodology approach, which can be considered by Irish organizations. This suggestion of implementing a new approach will reduce challenges encountered by project managers related to traditional management procedures and

weak technology software, also suggests reducing factors encountered throughout the construction lifecycle by detecting risks on time and reducing costs and project delays. In light of our findings, it's essential for future research to deeply analyse this methodology to identify if it would be suitable for implementation in Irish organizations.

Drawing from our analysis, the Gantt chart bar was highlighted as one of the relevant techniques to track the real-time costs of projects, which is a new insight identified by the researcher. The Gantt bar chart was previously considered for use only in the planning stage as a tool to schedule the time of each construction activity. Therefore, the recognition of its potential for tracking real-time costs represents a new insight in the field. To comprehensively understand this technique, it is suggested to study the various approaches to the Gant bar chart and identify how it is used by different project managers in the Irish construction industry.

Our research strongly supports the factors affecting cost control and how these factors affect not only Ireland but also the global construction industry. There is a clear indication that design change is a recurrent factor during the construction stage. A practical approach to overcoming this factor would be the implementation of change management in Irish organizations. By adopting this management method, organizations may see improvements in project cost savings. It is suggested to implement this process from the beginning of construction and to communicate the purpose of this approach to stakeholders.

Successfully performing a project within the estimated cost can be accomplished through the involvement of construction consultants, who, according to literature and findings bring knowledge and expertise to companies. The involvement of consultants, combined with the implementation of change management can improve cost performance throughout the construction lifecycle. With the appropriate involvement of consultants, organizations may benefit from adopting consultants' strategies. The literature review and findings support the positive influence of these practitioners. However, knowledge management is essential for construction stakeholders, to expand their comprehension of management practices and to be aware of the relevance of developing management methodologies. It’s recommended that Irish construction organizations apply training programs to enhance stakeholders' and team members’ understanding of the relevance of maintenance control procedures in trough construction lifecycle. By implementing these trainings, project managers would receive support from their organizations and team members. I believe

that if all the parties are aware of the importance of the control process, environmental work will become more effective and transparent, facilitating the sharing of correct information. This, in turn, will assist project managers in reducing the challenges they face as practitioners, thereby enhancing their capability and efficiency in the management process.

To conclude, the research demonstrates that certain techniques, challenges and factors are currently impacting in the construction industry and the problem of cost overruns in projects persists. Nevertheless, there are potential solutions that can be applied in the Irish construction sector to achieve projects within the budget. However, further investigation is needed to determine the positive impact of these possible solutions on Irish construction organizations.

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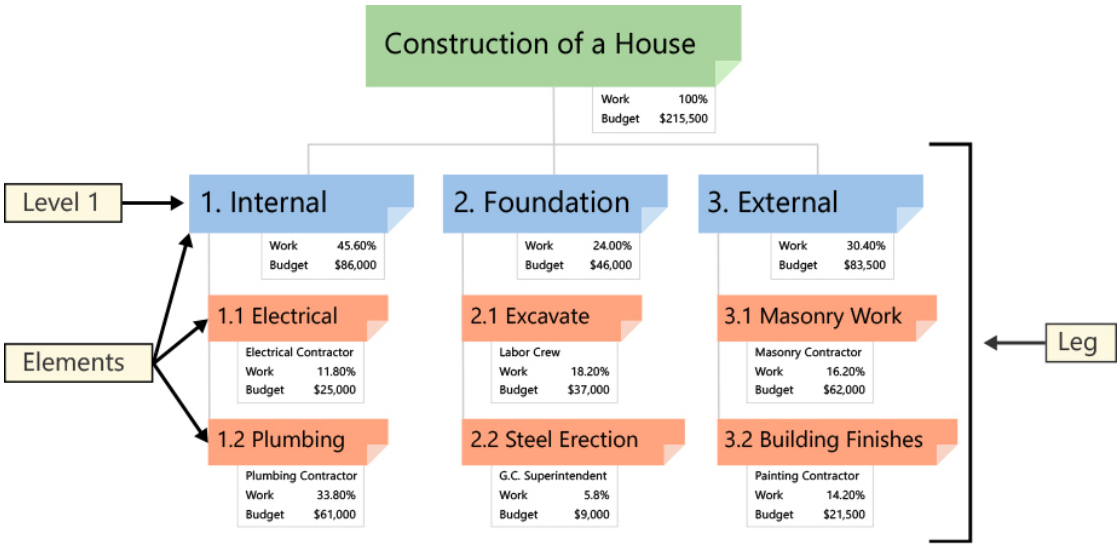
Appendices



Appendix 01. WBS structure.

Cost overrun factor	Reference no.
Price and cost	
Inaccurate time and cost estimations	1,3,4,5,6
Fluctuation of prices of materials	1,2,7,8
Lack of information available	3,4,9
Delay and extension of time	
Delays in material and equipment procurement	1,10,11
Delays in decision-making	1,11,12
Delays in planned activity	2,10,11
Project management	
Lack of experience	1,13
Lack of coordination/poor relationship between parties	1,2,14,15
Inadequate planning and scheduling	1,16,17
Inadequate monitoring and control	1,2,3,14,17
Poor contract management	1,3,17,18
Procurement and tendering	1, 3,17,19
Design	
Poor design and delays in design	1,2,3,20,21
Design changes	1,2,3,20,21,22
Changes in material specification and type	1,9,23
Design team performance	3,24,25
Construction	
Mistakes during construction	1,2,14,18
Additional works	1,2,23,18
Shortage of site workers	1,4,26
Poor site management and supervision	1,14,19
Waste on site	2,18,27
Payments	
Financial difficulties of owners	1,17,28
Mode of financing, bonds and payments	1,29,30
Dispute on bill settlements	2,12,17
Claims	3,12,17
Contractor specific factors	
Cashflow and financial difficulties faced by contractors	1,16,31
Incompetent subcontractors	1,3,18,19
Insolvency	1,32
Rework	1,33,34
Inaccurate site investigations	3,16,31
Consultants specific factors	
Unrealistic contract duration and requirements	1,16,19
Commercial pressures	3,16,18
Inaccurate quantities and omissions in the bills	2,16,34
Force majeure	
Severe weather	1
Unforeseen circumstances	1,2,3

Appendix 02. Lists of factors influencing techniques.

Appendix 03. Interview Questions

Interview transcript 1

Q. What cost control techniques do you identify as essential for the initiation, execution and closing construction stages?

A: Cost analysis is the correct and viable construction methodology, initiation stage is the crucial part for stakeholders. The execution stage must be controlled through specific software, such as BIM (building information modelling) nowadays, it's easier for project managers to use this technique to manage construction projects. An overall profit and loss of the project is effective in closing the project, this helps us to determine final results.

Q. Are there any common factors that affect the cost management process of the construction?

A: Project design changes affect significantly cost management performance, leading to increased costs and reduced efficiency. Also, the imprecise evaluation of project duration is particularly because clients don't present all the documentation at the initial stage, so makes it difficult for the management team to estimate the project's time.

Q. What cost mitigation measures would you suggest to put in place to reduce the factors affecting cost management?

A: Analysing the short, medium and long term of the project will be a preventive measure, these measures will assist the management team in establishing an accurate time duration and preventives asses to reduce cost risk.

Q. What benefits do companies gain from incorporating construction consultancies into their projects?"

A: Consultants can bring a viable solution by conducting an effective and personalized plan to help reduce costs and minimize risks.

Q: In your opinion do consultants have more knowledge about cost management and can easily apply better strategies?

A: Absolutely yes, Consultants have a deeper understanding of cost management and their knowledge comes from work experience rather than theoretical management learning.

Q: What are the most challenging aspects of your job as a project manager?

A: A challenge as a project manager is ensuring the compatibility of information, across diverse systems, stakeholders and teams. That's because come across project success, ensuring everyone is on the same page regarding project performance and must be clear data and easy to understand.

Q: What solutions would you suggest to overcome challenges faced by project managers?

A: Adoption of new software and methodology to improve the compatibility of documentation, and scheduling activities will help us as project managers to be more efficient.

Interview 2 transcript

Q. What cost control techniques do you identify as essential for the initiation, execution and closing construction stages?

A: In the initiation stage always must be applied project-estimated to define scope, budget and time. Monitoring the performance of subcontractors and suppliers encompasses the execution stage. Also, risk management to mitigate risks impacting the project and find solutions to solve them. The final process is setting up all financial accounts, and examining all costs through the project.

Q. Are there any common factors that affect the cost management process of the construction?

A: In my point of view, the common factor affecting our projects is the design modifications that happen in the execution stage, these changes are tough to manage and usually cost more money. I will say the lack of communication between the personnel on site and the management team affects the way that design changes are controlled.

Q. What cost mitigation measures would you suggest to put in place to reduce the factors affecting cost management?

A: To mitigate design changes may be helpful to identify their cause if it's due to a design error or a client request to alter the final design. Also, ensure that design changes are approved by authorized personnel, this will be related to change management strategy.

Q. What benefits do companies gain from incorporating construction consultancies into their projects?"

A: Identify risks in the early stages of the construction and possible solutions to reduce risk, these consultancies specialise in cost savings opportunities and can suggest more financial approaches to construction companies.

Q: In your opinion do consultants have more knowledge about cost management and can easily apply better strategies?

A: They are specialized in some areas of project management and one of them is cost management, so I believe they have more knowledge of advanced tools and resources for cost analyses and cost strategies. I will consider them essential in the performance of any project.

Q: What are the most challenging aspects of your job as a project manager?

A: It is tough for project managers to extend the management culture into organizations because of the traditional construction procedures. It is a challenge for us to set knowledge and skills management.

Q: What solutions would you suggest to overcome challenges faced by project managers?

A: Development of management practices in the organization's culture, and continuous training for project managers, teams and stakeholders to increase skills in areas like communication, risk asses and project management.

Interview 3 transcript

Q. What cost control techniques do you identify as essential for the initiation, execution and closing construction stages?

A: Accurate cost estimation and budgeting are critical in the initiation stage, setting the financial framework for the entire project. Real-time cost tracking and performance measurement against the budget are essential through the execution stage, to ensure costs are aligned with the plan. For the close stage, conducting thorough audits and reviews allows us to understand cost variances and apply lessons learned to future projects.

Q. Are there any common factors that affect the cost management process of the construction?

A: Material price fluctuations, labour costs, project scope changes, and unforeseen site conditions, can affect cost management. Economic factors like inflation or changes in regulatory requirements also play a significant role.

Q. What cost mitigation measures would you suggest to put in place to reduce the factors affecting cost management?

A: Robust procurement strategies, including fixed-price contracts, can be effective. Additionally, investing in quality planning and design can minimize expensive changes later. Regular risk assessments throughout the project lifecycle also help manage potential cost overruns by addressing issues proactively.

Q. What benefits do companies gain from incorporating construction consultancies into their projects?"

A: They bring specialised expertise that can enhance project efficiency and cost-effectiveness. They often provide advanced tools and methodologies for project management, risk assessment, and cost control. Their external perspective can also offer new insights that improve overall project performance.

Q: In your opinion do consultants have more knowledge about cost management and can easily apply better strategies?

A: They are experts in areas of specialization, including cost management. They are updated with the latest industry standards and best practices, which can be more challenging for internal teams to maintain. This expertise and knowledge allow them to identify and implement cost-saving strategies effectively.

Q: What are the most challenging aspects of your job as a project manager?

A: One of the most challenging aspects is managing the diverse needs and expectations of stakeholders while keeping the project on track and within budget. Additionally, dealing with unforeseen issues that arise during construction requires quick decision-making and flexibility.

Q: What solutions would you suggest to overcome challenges faced by project managers?

A: Strong communication skills are vital; keeping all stakeholders informed and engaged can mitigate many issues. Implementing robust project management

Interview 4 transcript

Q. What cost control techniques do you identify as essential for the initiation, execution and closing construction stages?

A: The Gantt bar chat is used in our projects, it is applied in the initial stage to plan the timeline for each activity and in the execution stage to control the progress and manage resources. Another technique used is the cost progress which means, to track the forecast work vs real cost progress work. When it is time to close the

A: The consultancies know project management procedures, bringing us support, they have an external opinion of the project performance and their management expertise assists our project planning, ensuring a more realistic timeline, and helping us to maintain estimated cost.

Q: In your opinion do consultants have more knowledge about cost management and can easily apply better strategies?

A: Through my experience, it's been always considered the opinion of a consultant because they are professionals who specialise in cost management. They have worked with different clients which allows them to understand cost challenges and the practice.

Q: What are the most challenging aspects of your job as a project manager?

A: Probably the difficulty of communicating management process among team and stakeholders. That's the case when a client requires some modifications and personnel working on site don't communicate on time to the management team and they make decisions by themselves.

Q: What solutions would you suggest to overcome challenges faced by project managers?

A: Establish communication channels for effective communication between team members and project managers, this can be defined through communication methods, regular meetings and encouraging transparency in the project environment.

Submission of Thesis and Dissertation

National College of Ireland
Research Students Declaration Form
(Thesis/Author Declaration Form)

Name: Laura Daniela Medina Gonzalez _____

Student Number: 22197346__

Degree for which thesis is submitted: MSc in International Business

Title of Thesis: Process and Techniques in Construction Cost Management in Irish Organizations

Thesis supervisor: Dr Gaia Barone_

Date: 13 May 2024

Material submitted for award

A. I declare that this work submitted has been composed by myself. ■

B. I declare that all verbatim extracts contained in the thesis have been distinguished by quotation marks and the sources of information specifically acknowledged. ■

C. I agree to my thesis being deposited in the NCI Library online open access repository NORMA. ■

D. ***Either*** *I declare that no material contained in the thesis has been used in any other submission for an academic award.
Or *I declare that the following material contained in the thesis formed part of a submission for the award of

_____
(State the award and the awarding body and list the material below) ■

Appendix 04. Submission of dissertation

National College of Ireland

Human Participants Ethical Review Application Form

All parts of the below form must be completed. However in certain cases where sections are not relevant to the proposed study, clearly mark NA in the box provided.

Part A: Title of Project and Contact Information

Name

Laura Daniela Medina Gonzalez

Student Number (if applicable)

x22197346

Email

X22197346@ncirl.ie

Status:

Undergraduate ☐
Postgraduate ■
Staff ☐

Title of Research Project

Process and Techniques in Construction Cost Management in Irish Organizations

Have you read the NCI Ethical Guidelines for Research with Human Participants?

Yes ■
No ☐

Please indicate any other ethical guidelines or codes of conduct you have consulted

N/A

Has this research been submitted to any other research ethics committee?

Yes ☐
No ■

If yes please provide details, and the outcomes of this process, if applicable:

N/A

Is this research supported by any form of research funding?

Yes ☐
No ■

If yes please provide details, and indicate whether any restrictions exist on the freedom of the researcher to publish the results:

N/A

Part B: Research Proposal

Briefly outline the following information (not more than 200 words in any section).

Proposed starting date and duration of project

May 2nd 2023 duration of 1 year.

The research aims and objectives

This study aims to provide valuable insights into mitigating budgetary risk and achieving desired project results, to investigate strategies for cost minimization in projects throughout design processes undertaken by construction companies, examine the proactive involvement of construction consultants in the field of cost management practices and investigate the allocation of responsibilities concerned with construction budget management within a corporate framework.

The rationale for the project

What strategies and mechanisms can construction companies employ to effectively decrease project costs throughout the design phase?

The research design

Qualitative research design

The methods of data collection

Case studies, interviews, document analysis, focus groups.

The research sample and sample size

Architects, Engineers, Construction Companies Managers.

The nature of any proposed pilot study

N/A

The methods of data analysis

Project reports, contracts, project plans, financial statements, and industry guidelines.

Part C: Ethical Risk

Please identify any ethical issues which will arise and how you will address them.

N/A

Please indicate any risk of harm or distress to participants.

N/A

Please indicate how you will address this risk (e.g. debriefing procedures, etc.).

N/A

Do the participants belong to any of the following vulnerable groups?
(Please tick all those involved).

- ☐ Children;
- ☐ The very elderly;
- ☐ People with an intellectual or learning disability
- ☐ Individuals or groups receiving help through the voluntary sector
- ☐ Those in a subordinate position to the researchers such as employees
- ☐ Other groups who might not understand the research and consent process
- ☐ Other vulnerable groups

How will the research participants in this study be selected, approached and recruited?

N/A

What inclusion or exclusion criteria will be used?

N/A

How will participants be informed of the nature of the study and participation?

N/A

What procedures will be used to document the participant's consent to participate?

N/A

If vulnerable groups are participating, what special arrangements will be made to deal with issues of informed consent/assent?

N/A

Please include copies of any information letters and consent forms with the application.

Part D: Confidentiality and Data Protection

Please indicate the form in which the data will be collected.

☐ Identified ☐ Potentially Identifiable ■ De-Identified

What arrangements are in place to ensure that the identity of participants is protected?

N/A

Please indicate any recording devices being used to collect data (e.g. audio/video).

N/A

Please describe the procedures for securing specific permission for the use of these recording devices in advance.

N/A

Please indicate the form in which the data will be stored.

□ Identified □ Potentially Identifiable ▉ De-Identified

Who will have responsibility for the data generated by the research?

N/A

Please describe the procedures for the storage and destruction of data.

N/A

Dissemination and Reporting

Please describe how the participants will be informed of dissemination and reporting (e.g. submission for examination, reporting, publications, and presentations).

N/A

If any dissemination entails the use of audio, video and/or photographic records (including direct quotes), please describe how participants will be informed of this in advance.

N/A

Part E: Signed Declaration

I confirm that I have read the NCI Ethical Guidelines for Research with Human Participants, and agree to abide by them in conducting this research. I also confirm that the information provided on this form is correct.

Signature of Applicant _ LDMG_____

Date _30/05/2023_____

Signature of Supervisor (where appropriate)

_____

Date _____

Appendix 05. Ethics Form Proposal.